Railroad Age Gazette

Including the Railroad Gazette and The Railway Age

PUBLISHED EVERY FRIDAY BY
THE RAILROAD GAZETTE (INC.), 83 FULTON STREET, NEW YORK.

CHICAGO: 160 Harrison St. PITTSBURGH: Farmers' Bank Bldg.
LONDON: Queen Anne's Chambers, Westminster.

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The address of the company is the address of the officers.

Subscription, including regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free.
United States and Mexico.....$5.00 a year
Canada.....$6.00 a year
Foreign Edition, London.....£1 12*s* ($8.00) a year
Single Copies.....15 cents each
Entered at the Post Office at New York as mail matter of the second class.

VOL. XLVI., No. 4. FRIDAY, JANUARY 22, 1909.

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Three years of negotiation of Presidents Mellen and Newman over the question of joint occupancy and operation of the Grand Central Terminal have resulted in Mr. Mellen's securing his main object of a sliding scale of payments based upon car and locomotive entry of the terminal, including the Mott Haven yards. This leaves the New Haven Company free to secure, if it can, new entrances to New York City with payments for the Grand Central diminished in ratio to any future decrease of usage. It opens in a future not remote a large vista of probabilities. There is the New Haven's Boston and Westchester charter, with its line tapping the waxing region of the Bronx and connection with the projected Lexington avenue-Broadway subway. There is the Hell Gate Bridge entrance connecting with the Pennsylvania Terminal, and a potential route for through trains southward, westward and eastward. And northward there is the Mellen project outlined some weeks ago of the extension from Portchester, N. Y., to Danbury, opening a great suburban region and shortening distance and time to the Berkshires. Such costly plans throw in vivid perspective not merely the importance of the long look ahead when providing for the terminals of a great city but the vastness and speed of the growth of the Metropolis itself. Men who, as boys, saw nothing above Forty-second street but Shantytown—and not much of that—may live to see New York jostling the Connecticut border and the question of railway terminals in the Bronx hardly secondary to the problem in Manhattan. That large rural tract bought above Westchester which President C. P. Clark used to call his "cornfield" may yet bear its golden harvest.

Bad and indifferent men cannot stand close supervision. They can be easily weeded out, *regardless of any labor organization.* This declaration is made by the general superintendent of a prominent road, and he is a man of wide experience. He is too modest to publish his name, but his letter, signed "Vidi," and printed on another page, is well worth reading. And by "close supervision" he means keeping such a constant and intelligent watch of the men's work that their merits and their demerits shall always be recorded with strict and judicious equity. The superintendent who gets a good quality of service out of his men without this kind of supervision has to thank the self-training and the good motives of his men, not his own efficiency as a superintendent. "Vidi" points out as one of the main weaknesses of railway management a fault which has often been denounced in these columns—assigning to superintendents and trainmasters too much territory or too many men. When this is the case important duties are delegated to inexperienced assistants. As to *why* labor unions are able sometimes to overawe the superintendent, our correspondent uses plain language: either the superintendent is inexperienced—is not fit for his job—or he lacks the courage to go to the bottom of the matter, get all the facts, and, in blaming an employee, take the time necessary to induce him to admit the reasonableness of the censure. Will any superintendent say that this is not a correct judgment? Finally, one of the best things in the letter of "Vidi" is his assertion that careless employees may be restored to the careful class. And he seems to imply that most "accidents" are chargeable to these men whose dulness or carelessness is due neither to a reckless disposition nor to the influence of a malicious brotherhood leader, but to "slack habits," which are curable.

By the collision at Dotsero, Colorado, last Friday night, killing 21 passengers, the public is once more reminded that the considerable progress which has been made during the past few years by the railways of the country in the use of the block system has not been uniform. On a large proportion of our principal railways the space interval has now been in use long enough to reduce appreciably the collision record, even as judged by the public, which is superficial and not exact in its judgments. Well-informed passengers now have a confidence which would have been unfounded five years ago. But here is a railway company running heavy through passenger trains which has no block signals at all. The line of its chief competitor is completely equipped with automatic block signals throughout its length of 1,000 miles. From the standpoint of the public the cause of the Dotsero collision calls for absolutely no comment, except that it is of a class so well known that every railway officer who cares knows the remedy. For over a year now the collision record, thanks to the dulness of traffic, has been less exciting than during the previous five years, and the superficial observer might almost conclude that there had been a universal improvement in methods of train management; but it needed only a glance at the records to show that the real problem of prevention still remained to be settled; or had been settled only in spots, here and there. The lists of prominent collisions, as given each month in the *Railroad Age Gazette* have, indeed, been short for many months; but in these records the degree of "prominence" is measured by the number of persons killed and injured, which often seems to be increased or diminished by pure luck. The government records tell a different story.

Those reports show a pretty accurate comparative record of the real danger; and a study of the facts shows that the danger to passengers and employees from collisions has not been reduced so much as the newspaper records would indicate. *Every month* there is a considerable number of collisions due to the same class of mistakes as that which figured at Dotsero. It may be that only one in ten, or twenty, or even a hundred, of such mistakes results in killing a lot of passengers; but the warning is there, just as plain as the sun in the sky. Moreover, the records of 1908, the year of light traffic, when examined in detail, are seen to be not without notable cases. In the three months ending with September there were five disasters to passenger trains, which killed in the aggregate 49 persons, and all but one of them were on lines where the block system was not in use. The fifth (Oakland) was a crossing collision. The five cases were: Boonville, N. Y.; Knobnoster, Mo., Oakland, Cal.; Plains, Mont., and Young's Point, Mont.

THE REPORT OF THE PUBLIC SERVICE COMMISSION FOR NEW YORK CITY.

The first two chapters of the report of the Public Service Commission, First District, have been submitted to the legislature. The first chapter summarizes the work of the commission during the past year and describes the routes for proposed new subways in Greater New York. The subject of adequate service is then discussed. "In transportation there is no unit of service other than that a passenger upon payment of a fare is entitled to a ride." While the commission recognizes that during the worst of the rush hours it is physically impossible to prevent crowding of cars, it takes as an ideal of adequate service, the provision, both by surface lines and subway and elevated roads, of a seat for every passenger who desires to ride. The orders for increase in service, increased equipment and new type of equipment issued in 1908 were framed with this ideal in mind.

This definition of adequate service is itself wholly inadequate. What might be considered adequate service rendered to a man who pays $4.65 to travel from New York to Boston is not adequate service for the man who pays $2 extra for a fast train and a parlor-car seat. If the commission should try to define what is adequate service *for five cents* it would approach the question in a much fairer manner. It is possible that compared with other transportation service rendered for the same money in, say, London or Berlin, space enough to stand in and a strap to cling to, with transportation from Two Hundred and Fiftieth street, Manhattan, to Atlantic avenue, Brooklyn, a distance of over 16 miles, is rather more than a passenger has a right to demand in return for his nickel. As long as a ride is charged for at a fixed rate, regardless of its length, the only fair standard of service is the average service rendered to the average passenger. Some figures for the average length of ride should be arrived at and for the average distance the ordinary man has to stand during his average ride; then the question should be asked, is he getting adequate service for his money?

The second chapter of the report makes suggestions for the amendment of the law which at present prevents the issue of bonds by the city beyond a certain limit for corporate purposes, including the issue of bonds for the construction of rapid transit facilities—subways, elevated structures, etc. The law also provides that the construction of subways may be paid for by the city, but the city has the right to lease the newly constructed subway to a private corporation for operation. The present subway was built in this manner. The contractors who built it are at present operating it and were given a 50-year lease. They are paying the interest on the construction cost, that is on the $40,000,000 bonds issued by the city and a certain part of their earnings in addition, to be used as a sinking fund to retire the city's construction bonds in 50 years. Since 1904 the law has been amended, so that the city cannot grant a lease to an operating company for longer than 20 years. The city is now in the position where it cannot build subways that are needed with its own credit, since its debt is approaching the limit, and it cannot induce private capital to invest in the building of subways, because the law does not leave it enough discretion in fixing terms of operation so that it can hold out any attractive inducement for the investment of privte capital. The commission suggests that greater latitude be permitted in the making of contracts between the city and companies which desire to operate rapid transit property, and also that bonds issued to build rapid transit facilities, on which the interest is being paid not by the taxpayer, but by the operating company, be exempt from the provisions of the debt limit law.

There are three types of routes that demand subways: 1. Routes connecting business and transportation centers. The operation of subways with this route should more than pay interest on construction cost. 2. Routes performing a service analogous to bridges. The operation of the rapid transit facilities with these routes may be unprofitable, or at a loss, but the loss should be borne by the whole community. 3. Routes into undeveloped parts of the city. The operation of rapid transit facilities with these routes may be at a loss, but the loss should be divided, part to be sustained by the city and part to be raised by assessment on the property directly benefited by the new subway or elevated. The recommendation that property holders who were benefited by a new subway should pay something toward its construction is eminently fair. The recommendation that bonds issued for the construction of a subway, the interest upon which is not a burden to the taxpayer, and the profits from the operation of which will at the end of a certain period of years pay off the principal of the bonds, leaving the city the owner of the subway, if adopted should go far toward solving the transportation problem in New York without having any of the bad moral effects of a removal of the debt limit by arbitrary legislation.

A NEW PLAN OF OPERATING ORGANIZATION ON THE HARRIMAN LINES.

An interesting and important experiment with a new form of maintenance and operating organization was begun on the Nebraska Division of the Union Pacific on January 14. On that date the following order was issued:

"Union Pacific Railroad Company. Nebraska Division. Office of Superintendent. Omaha, Neb., January 12, 1909. Circular No. 1. Effective January 14, 1909, the Nebraska Division discontinues among its officers the use of titles, Superintendent of Terminals, Master Mechanic, Division Engineer, Trainmaster, Traveling Engineer and Assistant Division Engineer. The following named officers are designated:

1. Thomas J. Foley, Assistant Superintendent.
2. George H. Likert, Assistant Superintendent.
3. Augustus D. Schermerhorn, Assistant Superintendent.
4. J. Walter Adams, Assistant Superintendent.
5. James P. Carey, Assistant Superintendent.
6. Chauncey C. Cornell, Assistant Superintendent.
7. John L. Allavie, Assistant Superintendent.
8. William H. Putcamp, Assistant Superintendent. They will be obeyed and respected accordingly.

"Each of the above named officers continues charged with the responsibilities heretofore devolving upon him, and in addition assumes such other duties as may from time to time be assigned. Such of the above as are located in the same building have one consolidated office file in common with the superintendent.

"All communications on the company's business, originating on this division, intended for the Superintendent, or for any Assistant Superintendent, should be addressed simply 'Assistant Superintendent' (telegrams 'A. S.'), no name being used unless the communication is intended to be personal rather than official, in which case it will be held unopened for the person addressed. It is intended that an Assistant Superintendent shall always be on duty in charge of the division headquarters offices during office hours. The designation of a particular Assistant Superintendent to handle specified classes of correspondence and telegrams is a matter concerning only this office. No officer should sign the name or initials of another.

The principle to guide subordinate officers and employees is to be governed by the latest instructions issued and received.

"Train orders will be given over the initials of the Chief Despatcher.

"The modification of pre-existing organization and methods herein ordered have been carefully worked out to expedite the company's business by the reduction and simplification of correspondence and records. It is expected and believed that officers and employees will insure a successful outcome by lending their usual intelligent co-operation and hearty support.

"Officers and other persons outside the jurisdiction of this division are requested to address official communications, 'Superintendent, Nebraska Division, Omaha, Nebraska,' (telegrams, 'Supt.'), without using the name of the Superintendent except for personal matter. William R. Cahill, Acting Superintendent. Approved: Charles Ware, Acting General Superintendent."

The change is not merely titular, but, as the circular shows, is functional; it involves a modification and broadening of the duties of all affected. If the experiment works well it may be the forerunner of an important reorganization of the entire maintenance and operation department of the Harriman system.

William Cahill, Assistant Superintendent of the division, who is now Acting Superintendent, will resume the title of Assistant Superintendent when Charles Ware, now Acting General Superintendent, resumes his regular duties as Superintendent of the Nebraska division. There will then be nine Assistant Superintendents.

The purpose of this change, and of others more extensive that are contemplated, is both to strengthen the existing operating and maintenance department, and to make it a better school for developing capable, resourceful, all-around operating officers. The operating department has three subdivisions, the transportation, the engineering, or roadway, and the mechanical. The hardest problem railway managers have is to get a simple and satisfactory correlation between these sub-divisions, and men competent to preside over all of them in the offices of superintendent, general superintendent, general manager and operating vice-president. Mr. Kruttschnitt, Director of Maintenance and Operation, and the Vice-Presidents and General Managers of the Harriman Lines, have given hard study to the subject; and Mr. Kruttschnitt hopes that in the plan referred to it has been found a solution of this vital problem.

In the way of strengthening the present organization, it will be noted that one of the effects of the change will be to destroy what has been facetiously but aptly termed, "government by chief clerks." Ordinarily when the superintendent of a division—or, for that matter, the general superintendent or a higher officer—is away from his office, his chief clerk writes letters and orders to which he signs his superior's name. As superintendents on the Harriman Lines are required to be on the road at least 15 days in every month, their chief clerks are practically acting superintendents one-half the time. Now, the chief clerk usually is a very faithful, experienced and competent employee, but he seldom has the equipment to perform the duties of superintendent. Under the plan being experimented with the work of the chief clerk will be confined to the supervision of the office force and the handling of statistics. The senior assistant superintendent will have no expense account; he will be in charge at headquarters throughout every working day. All communications on the company's business originating on the division and addressed to headquarters will be received and answered by him. In the absence of the superintendent, he instead of the chief clerk, will be acting superintendent.

There is always danger that a railway operative who is kept long at a desk will develop the academic tendencies of office government. For this reason, the senior assistant superintendent, after being kept at headquarters four or six months, will be assigned to other duties for which he is fitted, and some other assistant superintendent will take charge at headquarters and while there will be senior assistant. Thus each of the assistant superintendents, who formerly had the various titles of division engineer, master mechanic, trainmaster, etc., may perhaps serve in rotation at headquarters, and get experience in supervising the operation of the entire division. Each will know all about either the transportation, or the mechanical or the engineering departments of the division, according to his special training, and something about each of the other departments.

Each assistant superintendent has an office at headquarters, but is forbidden to keep a separate office file. He is permitted to write only a few letters to subordinates in his particular branch of the work, for which he still retains full responsibility. He may not write letters to his fellow heads of departments next door; all letters for them must be addressed to the senior assistant superintendent. He may not write letters to superior authority direct, but must submit them for the signature of the superintendent. Duplication of letters and instructions is prevented by the major portion being dictated by the senior assistant at headquarters. It is believed that by this system the number of letters written will be reduced 40 to 50 per cent.; and that, relieved from the care of a bureau of papers, and from handling a great deal of correspondence, each officer will be able to spend much more time on the road or in the shops, and in thinking about and intelligently planning his work.

It is expected that discipline will be improved by the fact that each officer, like the officer of a vessel, has the authority indicated by his title. Each assistant superintendent, regardless of his special work, will have authority over every officer or employee of lower rank, whether locomotive engineer, conductor or mechanic. The former master mechanic, now assistant superintedent, can tell the young brakeman that the safety of the public will be increased by prompter flagging next time without being "sassed." The late division engineer can help do missionary work along the line of careful stoking. The former traveling engineer can advise the conductor as well as the engineman how better to get trains over the road. Each assistant superintendent, having general jurisdiction over all departments, each will naturally begin to note and suggest defective appliances and methods and possible improvements outside as well as inside his special line. If a blockade or an accident occurs the superintendent can scatter his assistants to the crucial points. On arrival each has authority over all available forces instead of over only a part. Back at the headquarters is the senior assistant controlling all the interlocking levers of administration. The new system of organization is based on the conception of all-around administrative usefulness to supplement the necessary specialization of the individual officer in his particular branch.

While A. L. Mohler, Vice-President and General Manager of the Union Pacific, and his staff were the first to ask for an opportunity to try the new scheme, it will be tried on other parts of the Harriman Lines as fast as details can be worked out to meet local conditions; and it is expected that the same principle of organization will be applied to other operating units, both above and below the division. Already it is being arranged on some small terminals to have the roundhouse foreman become also yardmaster. Where the volume of business is too heavy for such a dual position the one officer may be appointed the assistant of another. It is desired to bury the old post-mortem question of whether the train or the engine was ready first. An extension upward of the same principle of organization would make the general superintendent, the general superintendent of motive power and the chief engineer all assistant general managers, with general and special authority and duties similar to those of the assistant superintendents of a division.

The foregoing indicates some of the ways in which it is expected the new scheme of organization will tend immediately to strengthen the maintenance and operating department. But it is being tried more for ultimate than for immediate results. Its keynote is, "Education." The best criterion of the perfection of any organization is whether it is self-

perpetuating. It was said of Napoleon's army that every private carried a marshal's baton in his knapsack. This was one way of saying that no rule, precedent or custom barred an able fighter, no matter what his rank or training, from aspiring to the highest commands. The result was that every man was stimulated to attain the highest efficiency, and that when an officer fell there was always present someone fitted to take his place. Now, something like this, it is conceived, should be true of railway operating and maintenance organization. The railway operating department is a great army; at high-water mark in 1907 there were 118,000 men on the payrolls of the Harriman Lines. An army is divided into cavalry, infantry and artillery; it has staff as well as line officers. Similarly, a railway operating department has its transportation, mechanical and engineering sub-divisions. That most of the fighting of an army is done by infantry, does not prevent an artillery or engineer officer from rising to the rank of marshal or lieutenant-general. Napoleon was an artillery officer; Robert E. Lee, one of the greatest military geniuses of American history, was an engineer officer. It is well-known that few American railway operating departments are self-perpetuating. When the office of general superintendent, or general manager or vice-president becomes vacant the management is apt to go to some other road for a man of enough ability and breadth of experience to fill it. It is well-known also that on all but a few roads only transportation officers can hopefully aspire to the highest places. Except on the Pennsylvania, the civil engineer seldom gets higher than chief engineer; the mechanical man seldom gets higher than superintendent of motive power. Such railway presidents as Marvin Hughitt, A. J. Earling, W. C. Brown, Milton H. Smith, T. M. Emerson, A. J. Davidson and H. I. Miller rose through the transportation department from telegraph operators; and a legion of vice-presidents has come up the same way. The number of civil engineers who have risen to the top is relatively very small, and the number of mechanical employees and officers still smaller. Scattered far apart, indeed, are the former locomotive enginemen, like Daniel Willard of the Burlington, whose native ability and indomitable energy have enabled them to climb to the top; and perhaps Mr. Willard would not have gone so high if he had not been transferred to the transportation department by being promoted from locomotive engineer to trainmaster.

Mr. Kruttschnitt,—himself an engineer,—thinks the facts, that railway organizations are often not self-perpetuating, and that engineering and mechanical officers so seldom rise to the highest positions, are related. He believes that with over 100,000 men in their employ, the Harriman Lines, with the right kind of organization, should be able to train and develop plenty of men as able and as broad in experience as can be found elsewhere, and who will have the additional advantage of close familiarity with the methods, equipment, etc., of these lines. But he also believes that in order to develop plenty of men from whom to select officers to preside over the various grades and sub-divisions of the operating department, something must be done to open wider the door or opportunity to the engineering and mechanical officers, and to broaden their training and experience, as well as those of the transportation officers. Under present conditions on most roads it is natural that only transportation men should rise to superintendents, general managers and vice-presidents. The primary work of the railway is to furnish transportation, keeping motive power and roadway in good condition being auxiliary to this. The main work of the superintendent, therefore, is to get trains over the road. When he looks about for an assistant superintendent he may find no one who has had experience in this work but the trainmaster, usually a former despatcher; so the trainmaster becomes assistant superintendent. Just as naturally, when the office of superintendent becomes vacant the assistant superintendent gets it; and so it usually goes clear up the line. But suppose the superintendent had on his staff a man of much natural ability who was a mechanical or engineering expert and also had had some experience and had developed skill in getting trains over the road. In such a case, when the superintendent was promoted he would be apt to recommend the former master mechanic or division engineer as his successor.

Now, the main object of making assistant superintendents of the former division engineers, master mechanics, traveling engineers, etc., is to give to each of them broader training and opportunity so that not merely the transportation man, but the man, whatever his special work, who has shown the most ability, can be advanced. Similarly, the object of making assistant general managers of general superintendents, superintendents of motive power and chief engineers would be to give them all a broad training and experience so that the management would not be forced either to promote a transportation specialist to general manager or go off the road for a man to fill that office, but could choose for it the assistant general manager who, regardless of his special line of work, had shown the greatest capacity for supervising the work of all the departments. The change, it is believed, would make officers more capable, both by broadening the experience of all, and by stimulating the energies of many through greater opportunitiy, and would give the management about three times as many capable men to select from in filling the more important offices.

The foregoing describes the plan and aims of the officers of the Harriman Lines. The scheme, avowedly, is in a tentative stage. That the ordinary operating and maintenance organization has imperfections is recognized by all thoughtful railway operatives. Many may doubt if the experimental, quasi military method being tried on the Harriman Lines will prove the cure for those imperfections. But all, at least, will be glad a new scheme is being tried by such capable hands, and will study the results with the greatest interest.

THE BEAD ENDS OF LOCOMOTIVE TUBES.

One of the most frequent causes of locomotive failures is leaky tubes and the use of high-pressure steam in recent years has greatly agravated this and other boiler failures. On some roads in the West conditions were so bad that it was necessary to reduce boiler pressure; on others the use of water purification and the intelligent care of the boiler in maintaining more uniform temperatures have greatly improved conditions and materially reduced tube leakages. These efforts have been directed largely to matters connected with steam and water and not to the tube itself in its mechanical and chemical relations.

Two recent papers on tubes have to do principally with the causes of leaks, one as due to the failure of the bead end and the other to slipping of the joint, and, though from far distant sources, these two papers have an important connection which will be here briefly outlined. In his paper on "Locomotive Flues—Endurance of Material," read at the October meeting of the Richmond Railroad Club, Alexander Kearney said that modern service makes greater demands, and locomotive boilers and fireboxes had been changed and improved in many ways in order to adapt them to high pressures. But though the tube length has been greatly increased, the thickness and the methods of securing them in the tube sheet remained the same.

The constant and excessive rolling of the tube end in the effort to stop leaking makes it and the copper ferrules thinner and the latter are driven inward by the rolling. On account of this abuse the more general use of the tube expander is favored as a substitute for rolling. The tube sheets are also deeply guttered by the use of the beading tool, and on the Norfolk & Western Railway they have had unusual trouble

from the gradual burning off of the beads, some of them being entirely destroyed in eight months' service. This condition led to an interesting investigation of the bead end of tubes as affected by the mechanical working in setting and by the chemical composition of the tube material, all of which is fully described in Mr. Kearney's paper.

Retightening a tube has a tendency to draw the bead, and while this result is not pronounced with a good expander it is decidedly so with the roller. The destructive effect thus produced by rapidly thinning the tube under the roller is serious and materially reduces its life. When by excessive rolling the beads are abnormally drawn and become larger this stock added to the bead is distorted, unduly punishing the fiber and materially hastening certain destruction. When the expander is followed by the beading tool the tube sheet is guttered, but by careful manipulation this can be so controlled as to make the general use of the expander profitable and desirable.

The investigation of the failure of tube beads under mechanical punishment led to a study of the chemical composition of tubes and the effect of gases on them, when in a highly heated condition. It is well known that metals when heated to the higher temperatures and exposed to certain gases will absorb them to some extent, holding them by mechanical occlusion, also by direct combination, thus forming new and deleterious impurities. An analysis of portions of metal removed from beads worn by exposure to the furnace gases and sparks showed that they had a high content of sulphur. The amount of sulphur at the extreme end of the bead after the deterioration had reached an advanced stage, was as high as 0.137 per cent., decreasing to 0.04 per cent. at the fire side of the tube sheet and to 0.025 on the water side.

It was concluded that this excess sulphur hastens deterioration, also that some other elements have a bad effect. Nitrogen is present in iron and steel from a mere trace to 0.03 per cent. and nitrogen in unstable combination is a dangerous impurity. It might be doubted whether the beads can become red hot when exposed to hot gases having a temperature of nearly 2,000 deg. F. but with water circulating on the ½-in. tube sheet. There is a seam between the bead and the sheet, and often an actual air space where the bead is not solid against the sheet. At such points the resistance to the transmission of heat is far greater than that of the solid sheet and it is easily possible for the bead to become overheated.

The original quality of the tube metal when new is affected by the content of manganese and carbon, each increasing the strength and the former counteracting the influence of sulphur by diminishing the fusibility of the metal and decreasing the tendency toward lamination. The Master Mechanics' specification for cold drawn steel tubes gives the desired limits for carbon 0.15 to 0.20 and for manganese 0.45 to 0.55, but these limits were probably fixed with respect to the effect of these elements on the mechanical working by rolling and beading and had no reference to the subsequent deterioration of the tube from the effects of heat and the furnace gases. Mr. Kearney suggests that small circumferential cracks in the tube ends may be due to the larger amount of manganese in proportion to carbon, also that as manganese increases the melting point of steel it decreases the solubility of the gases in the metal and may have a direct bearing on the extent of the absorption of sulphur and nitrogen.

It is a common opinion that low carbon in steel improves the resistances to high temperatures. The condition of combined carbon and the annealing of the tube ends make the initial working incident to application less destructive, but it is a fact that many railways have abandoned the practice of annealing without apparently affecting the life of the tube. The effect of annealing is so small that it is soon lost under the high temperature to which the tube end is subjected in the firebox. There is ample opportunity here for an investigation by railway laboratories to determine the proper chemical specification for steel tubes. The work done by the chemist of the Norfolk & Western has led Mr. Kearney to suggest that the proportions for carbon and manganese in the present Master Mechanics' specification should be materially modified; combined carbon should be 0.08 and manganese as low as 0.20 to 0.30.

In connection with this investigation on the Norfolk & Western some experiments have been made by dispensing entirely with the beads and placing the tube ends flush with the firebox side of the tube sheet. Several locomotives have been fitted up in this way, leaving the beads off all the tubes in the firebox end, and one engine was fitted with a portion of the lower tubes beaded, and others flush. On this engine while all of the tubes required a certain amount of attention it was found that the beaded tubes were worked upon 2.3 times as often as those without beads. In the discussion of the paper one member reported an engine without beads on the tube ends as having been in service ten years, probably under low boiler pressure.

The beading of tubes is not intended primarily to assist in bracing the tube sheet against internal pressure, as the same pressure is exerted against the front tube sheet and there the tubes are seldom if ever beaded. The bead is used as a means of making a tight joint and supplements the joint of the rolled tube against the sides of the holes in the tube sheet. If this is imperfect the leak may be prevented by a tight bead but a very slight slip will loosen both joints, and if the bead leaks the joint is caulked by the beading tool. The whole system fails because the tube has not been properly fixed in the tube sheet and beading is resorted to in order to patch up a poor job of rolling or expanding or other careful fitting of the tube to the sheet. It seems important therefore that more accurate investigation should be made on the improvements of the joint in the tube sheet in order to make it tight and reliable, so that it will not be necessary to resort to beading.

The relation of leakage to the slipping of the tube in the sheet and the shape of the joint has been made the subject of some careful experiments by Professors O. P. Hood and G. L. Christensen, of Houghton, Mich. The results of their investigation are given in a paper read at the recent meeting of the American Society of Mechanical Engineers under the title, "The Slipping Point of Rolled Boiler Tube Joints." The paper contains a number of diagrams, tables and drawings, which should be referred to by those particularly interested in the subject. As the result of their investigation the authors reach the important conclusions that "(a) the frictional resistance of a 3-in., 12-gage, cold drawn steel tube in a ⅝-in. tube sheet is 750 lbs. per sq. in. of tube area when the tube is rolled into a straight, smooth machined hole. (b) Serrating the tube seat by cutting square edged grooves about $^1/_{100}$ in. deep and ten pitch will raise the slipping point to three or four times that in a smooth hole. (c) It is possible to make a rolled joint that will offer a resistance beyond the elastic limit of the tube and remain tight." An abstract of this interesting paper will be found on another page of this issue.

NEW PUBLICATIONS.

Proceedings of the Traveling Engineers' Association.—Sixteenth Annual Convention. Published by the Secretary at Buffalo, N. Y. 346 pages; 6 in. by 9 in.; illustrated. Leather.

The subjects presented to the convention, which was held in Detroit in August, 1908, are as follows: The Electric Locomotive; Influence of Education on the Work of the Engineer and Fireman; Steam Reversing Gear; Air Pump Exhaust Pipe; Steam Heat Operation in Train Service; The Territory to be Covered by the Road Foreman of Engines; Terminal Tests of New Types of Locomotive Brakes; Superheated Steam and the Best Method of Getting Good Results; Good Practice for Traveling Engineers in the Matter of Coaching Fire-

men and Method of Interesting Engineers and Foremen to Keep Themselves Posted on the Progress of Events.

These subjects are all well handled and are in some respects interesting and indicative of the attitude of the members towards new and old locomotive appliances. For example, it seemed to be the opinion that the steam reversing gear, while interesting as a piece of mechanism is of no practical value on the ordinary locomotive as the valves can be handled more readily by hand. But in the case of the Mallet compound locomotive, where two sets of valve gears are to be moved, it is a necessity. A portion of the papers were descriptive of the various types of apparatus that are used.

Proceedings of the Fifteenth Annual Convention of The Air Brake Association. 294 pages; 6 in. by 8½ in.; 21 illustrations; flexible leather cover.

The fifteenth annual convention of the Air Brake Association was held in St. Paul in June, 1908, and the proceedings are just out in the book under consideration. It is presented in the usual form and is typographically attractive but it has one decided defect in that it is printed without any index or table of contents so that the only way in which to obtain any idea at all of its contents is to turn the leaves, one at a time. By doing this it will be found that the subjects treated include: Brake Pipe Leakage, Its Cause and Prevention: Test for Brake Cylinder Leakage; Breaking-in-two of Heavy Modern Passenger Trains, Their Cause, Remedies and Avoidance; Brake Beam Release Springs, Their Beneficial and Detrimental Effects, with Suggestions for Modification; Triple Valve Lubrication; Report on Recommended Practice; Introduction to the Study of Air Brakes, with Special Reference to Questions and Answers on E. T. Equipment. These subjects were usually presented very briefly and were then very fully discussed.

Cement Laboratory Manual. By L. A. Waterbury, C.E. New York: John Wiley & Sons. 122 pages; 5 in. by 7 in.; 28 illustrations. Cloth. Price, $1.00.

The author of this book is at present professor of civil engineering in the University of Arizona, and it was prepared especially for the use of students in the University of Illinois, with the dictinct disclaimer in the preface that the book was "intended to serve as instructions for the testing of cements for commercial purposes." But it is quite evident that any student who shall have successfully completed the problems that are given, would be able to do testing for such purposes.

The work is very systematically arranged and is divided into descriptions of a series of tests that are to be made. In the first chapter there are the general instructions governing the laboratory work, such as the assignment of lockers, distribution of apparatus, cleanliness, responsibility for breakages, etc. Then follows a brief but clearly detailed description of the various tools and pieces of apparatus to be used, accompanied by illustrations that make the text readily comprehensible. Then follows the real essence of the work in the third chapter which consists of the statement of the series of tests that are to be made. They start in with the simple determination of fineness, and pass on through that of weight, specific gravity, plasticity, soundness, the time of setting, tensile strength at different ages and with various methods of molding, with a final problem on compressive strength.

The statement of these problems is complete in every detail. First is given a list of the pieces of apparatus required, then the material, then careful instructions of the methods to be employed, taking up each consecutive step, even to the cautions against the danger of breakages of the apparatus, and finally an outline of the report that is to be rendered. So fully and thoroughly has this been done that it ought to be quite possible for a student of a degree of intelligence that is far below what we are pleased to call the average, to take up this work, and by following the instructions of the manual, bring it to a successful conclusion without the necessity of an instructor at all. The writer has evidently taken it for granted that the student has not even the most elementary glimmering of an idea on the subject and must be told everything, and then proceeds to tell him that everything in a clear, concise manner following a logical sequence of events that reaches the goal in the briefest possible time.

So while the book is ostensibly intended for student work only, it will be a most valuable manual to be placed at the elbow of the man who has to do with commercial work, and this value is increased by the insertion as appendices, of the tests, specifications and methods of chemical analysis suggested by the American Society of Civil Engineers, the American Society for Testing Materials and the New York Section of the Society for Chemical Industry.

Letters to the Editor.

PRIVATE CARS.

Pittsburgh, Pa., January 6, 1909.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

In your issue of January 1st you have an article on the subject of "Private Cars" from an unknown writer from Chicago who signs himself, "Statistics." The article appearing over his signature in your paper is, of course, a voucher as to the reality of this personage, but when a question of veracity is raised on a statement of facts the identity of the writer is always desirable.

The matter contained in the paper read by the writer at the meeting in Cincinnati was prepared with the idea in view of giving meat enough with which to prove the question at issue. Further facts were also prepared for presentation in order that they might be incorporated in the minutes of the proceedings of the meeting of the Association.

Having been unable to obtain such an adversary at the meeting in Cincinnati, as is in every way desirable and who is not afraid to fight his fight in the open, I shall, Mr. Editor, with your permission (and good-will, I know) answer "Statistics."

In the paper read at Cincinnati it was intended by the writer as an argument showing the cause for, and necessary existence of privately-owned cars. By using such figures as were then obtainable from reports of the Association of Transportation and Car Accounting Officers, demonstration was made of the inability of the railways, members of that Association, to properly handle the business of the country between the years 1904 and 1908. The private car owner was not the result of any desire on his part to "Come to the rescue of the suffering public," to quote from "Statistics," but is the result of a lack of willingness or business foresight on the part of railway management to properly care for the business interests of the country, which the law says are committed to their keeping.

In a further discussion at the meeting in Cincinnati the next day after reading the paper in question, it was then shown by the writer that the increase in freight car equipment among the 60 railways referred to in the paper, members of the Association, was only 13 per cent. This percentage proportion of these 60 roads was obtained by eliminating from the total number given in paper all cars other than those used for freight service, such as passenger, baggage, maintenance of way, and all other equipment to the number of over 103,000 cars, which were used to make up the 20.5 per cent. increase. This percentage of increase did not apply to the railways of the United States, as is claimed by "Statistics" in his article, but only to 60 of the railways of the Association above referred to, who were members continuously during the period named, and whose total equipment of freight, passenger and all other kinds of equipment was each equal to 10,000 cars or over.

In an open letter to the American Mining Congress, which

met in Pittsburgh last December, E. H. Harriman, of New York City, makes a plea for fair treatment for the railways of the country. He gives in this article contained in over two columns of a daily paper the tonnage statistics, the comparative cost and return from railway investment of capital, and in conclusion asks that the laws passed may not become too burdensome as to cause loss of revenue or demoralization of the service required.

On the subject of mineral products, Mr. Harriman has this to say:

"The total tonnage reported by the Interstate Commerce Commission as originating on American railways in 1906 was 820,000,000 tons. Of this the crude products of the mine aggregated more than 435,000,000 tons, or 53 per cent. of the total tonnage. Add to this 89,000,000 tons of manufactured mineral products, such as cement, lime, steel, etc., and we have a total mineral production transported by the railways of approximately 525,000,000 tons, or 64 per cent. of the entire freight business of the country. In addition to this the railways hauled for their own use about 100,000,000 tons of coal during the year, or 275,000 tons each day. Of other freights during the year, the products of the forest, agriculture, merchandise, animals and manufactures (excluding the 89,000,000 tons of manufactured mineral products) make 36 per cent. of this total haulage."

In the paper read by the writer to which exception was taken by "Statistics" the partial list of the mineral production of the United States was given as 544,159,710 tons in 1906, and he wants to know who handled the surplus tonnage. In reply to his question, it is quite evident that he has forgotten the existence of the Great Lakes, the rivers and other inland means of water transportation, as well as the various coastwise trade of the eastern, southern and western part of our country. At the present time the company employing the writer has over 1,000,000 tons of bituminous coal loaded in barges and awaiting a rise in the Ohio river in order to be sent to southern markets.

Mr. Statistics does not seem to be such a bad hand in manipulating figures himself. From his name, I presume years of experience has given him certain tactful knowledge as to the manner in which the truth can be so clothed as to tell only one-half the truth, and yet appear to be the real thing itself, as for instance:

He gives the number of coal cars in railway service in 1904, based on an average of 33 tons, assumes an increase of 38 per cent. in the total number and the average increase in capacity as 39 tons per car, deducing therefrom an increase in capacity equal to 42.2 per cent.—which looks good on paper.

The most strenuous objection which could be raised to this sort of figuring is that the statistician starts out on a wrong assumption. The per cent. of increase should first be determined by elimination of all the old cars of small capacity, and which were destroyed in order to give place to those built of an increased capacity. If "Statistics" can get at the exact figures on this subject, he can do more than other well versed gentlemen we know. One railway man at Cincinnati informed me their road had 120,000 50-ton steel hopper cars at present in service. The records of this road show 72,000 wooden box and gondola cars of 30-tons capacity or less, which have been sent to other roads because their life would be endangered by actual service on the owning roads because of their age and disability when used in train service containing the heavier equipment of later build.

In the November number of the Register this road referred to is credited with a total of 166,130 cars of all kinds, of which about 11,000 were passenger and other than that used in freight service. The 120,000 50-ton cars, as given by this gentleman, added to the 72,000 used on foreign roads makes a total of about 192,000 freight cars credited to this road. This would make a difference of about 37,000 cars more of freight equipment than this road actually owned. It is indeed true that "figures won't lie," except under certain well-known conditions.

Objection is made by "Statistics" to the statement contained in the paper read at Cincinnati by the writer that $30 per car was the net earnings of a road hauling coal from Pittsburgh to the lakes. The figure named was given as it came from one of the officials of the railway in question. This road is a feeder of one of the trunk lines of our country, and from his past experience "Statistics" can doubtless solve the problem of 70 per cent. expense or more as operating cost on a long haul, and about 20 per cent. operating cost on one of its branch lines.

In concluding his letter previously referred to, Mr. Harriman has this to say:

"In conclusion, let me impress on you the fact that the interests of producers, of consumers and of the transportation agencies that bring them together in the markets of this country and of the world are mutual and interdependent. We cannot afford to so adjust our rates as to place undue burdens on your businesses, for that would arrest the development of our traffic. You cannot afford to cause lawmakers and railway commissions to continue unduly to increase our operating expenses and reduce our earnings, and thereby hinder the expansion of our facilities: for that will arrest the growth of your business and the increase in the value of your properties. As our interests are mutual and interdependent, we will all gain by recognizing frankly one another's legal and moral rights and cooperate in the broad and intelligent spirit for the promotion of the development and progress of this marvelously promising country."

To all of this, the writer gives a most hearty and energetic "Amen," as supplying the sentiments expressed by Mr. Harriman to the cost of operation and repairs to cars of private ownership on the railways of the United States.

ROBERT J. BAILEY,
Secretary, Individual Car Owners' Association of the U. S.

PREVENTION OF ACCIDENTS DUE TO DISOBEDIENCE OF RULES.

St. Louis, December 4, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

In the *Railroad Age Gazette* of November 20, page 1,407, I note an article in regard to a convention held in Indiana under the auspices of the State Railroad Commission to discuss the best means to prevent accidents. Representatives from the commission and railroad officials, as well as train and enginemen, were present. Certain speakers intimated that investigations as to causes of accidents were sometimes avoided because officials were timid about clashing with labor organizations.

I cannot but believe (if it is a fact that such conditions exist) that it is largely due either to lack of experience upon the part of the person conducting the investigation or to the fact that the investigation was not thorough enough. If, after an accident occurs, the investigation is conducted in a thorough manner and the persons at fault are properly disciplined, no one need fear any railroad labor organization. I say this after much experience with salaried committeemen representing the various organizations on a large railroad.

If care had been exercised in the past to properly administer discipline to those who violated rules, and the necessary time had been taken by superintendents to carry their investigations far enough to make it clear to those at fault wherein they erred, labor organizations would not be as prominent to-day as they are.

In the *Railway Age* about two years ago I gave briefly my views with respect to methods that would aid in preventing

a large percentage of the accidents occurring from causes chargeable to the transportation department. From careful study of the subject since then, I am still of the opinion that on many roads not enough care is taken to require the rules to be obeyed when accidents do not occur. It seems to be the rule, rather, to wait until an accident occurs and then take action with those at fault, without ascertaining to what extent the rules violated (which caused the accident) had been disobeyed by other employees without any question ever being raised.

To my mind nothing will do more to prevent accidents due to causes controlled by the transportation department than to require the rules to be obeyed, and to take the necessary action to bring about this result, without waiting for accidents to occur. To do this, however, it will be necessary to have closer supervision than most roads provide. The trainmaster's territory should be short enough to enable him to cover it easily each day. The superintendent's territory should be short enough to enable him to know all the train and enginemen personally, and to be so well acquainted with each one that he will know his habits and disposition.

I am aware that on some roads the men are given demerit marks before accidents occur, but is the supervision close enough so that this is judiciously done? Is it close enough to insure all being dealt with equitably? And is it close enough to get records of the good acts, as well as the bad ones? Unless it is, there is a weakness that will never be overcome by waiting until an accident occurs, even if severe action is then taken with those at fault.

Bad and indifferent men cannot stand close supervision. They can be easily weeded out, regardless of any labor organization. On the other hand, men who are naturally good, but who may have drifted into slack habits through lack of proper education or the right kind of supervision, will be gradually led back to proper ways and they will retain their positions. Many a man who would have been a good conductor, brakeman or engineman, with proper training, has been dismissed after an accident occurs, when with the right kind of education he would have prevented the accident and saved his position. He had gradually drifted into careless ways because of improper supervision.

Not only should the territory of a superintendent or a trainmaster be short enough to permit of their frequently visiting all parts; they should be able to spend a reasonable time at division terminals and other places where employes congregate, and to give more attention to that feature of their work than is usually done. Too often, particularly during busy seasons, the work of employing men is delegated to yardmen and even clerks, and thus undesirable men creep into the service. It is true that these undesirables can be got rid of, but much good can be accomplished by exercising additional care in employing men.

There is another point in connection with accidents that I have not seen much discussed; accidents that have been caused by some infraction of the rules upon the part of the trainmen or enginemen, but which would have been prevented by proper care upon the part of the train despatcher. The standard rules are rather silent on safe practices pertaining to train dispatching, but the old time despatchers maintained many precautions under what we might call unwritten rules, which were of much value. But as the requirements of the office became more burdensome the younger men gradually dropped these safeguards until now they are often lost sight of. The chief train despatcher should frequently check the order book and also the train orders turned in by train and enginemen at the end of their trip. This should be arranged for by lessening their other work and giving them more time to properly attend to the duties of a chief despatcher. Where the territory of superintendents and trainmasters has been long, it has caused both of these officials to unload a large amount of work on the chief despatcher. This is unfair. VIDI.

VERTICAL PLAY AT RAIL JOINTS.

Nice-Cimiez (France), Palais Buisine, December 6th, 1908.

To the Editor of the Railroad Age Gazette:

The recent reduction of the maximum width of rail head indicates that the Pennsylvania and the Canadian Pacific are not considering the use of supported lapped joints, but that they have come to the same conclusion the Saxony and Bavarian State Railways had come to some ten years ago, when facing fishplates were used.

These fishplates and the fishrails with vertical play, as illustrated on page 1103 of the Bulletin of the International Railway Congress, October, 1908, also belong to the "Growth of the Angle Bar" (your issue Nov. 6, 1908).

It remains to be seen which growth will outgrow the other, provided the cultivators care to find out what they don't know, namely, what vertical play will do!

MAX BARSCHALL.

FLAT SPOTS ON CAR WHEELS.

Woodside, Hexham, England, December 21, 1908.

To the Editor of the Railroad Age Gazette:

A printer's error in the formula given by E. E. Stetson in your issue of Dec. 4 requires correction by the substitution of t^2 for t and of g for 9.

It is desirable to note that the result given is correct only when no spring is interposed between the car and the sale; the reaction of a spring under a loaded car will increase the acceleration to say $16 \times g$, and the limit of speed for possible bounding of the wheel will be raised from 4.55 to 18.2 miles per hour.

J. D. TWINBERROW.
Assoc. M. Inst. C. E., M. I. Mech. Eng.

Montreal, December 30, 1908.

To the Editor of the Railroad Age Gazette:

I have just noticed letter by E. E. Stetson in the *Railroad Age Gazette* of December 4, 1908, criticizing the letter written by Prof. Chas. H. Benjamin, published in your issue of Nov. 27, 1908, regarding flat spots on car wheels. To quote Mr. Stetson, "Consequently Prof. Hancock's formula is incorrect for all speeds greater than 'X'" and in an assumed case he makes this speed 4.55 miles per hour. To quote Mr. Stetson further: "The absolute value of the results obtained by applying a mathematical formula to conditions so far outside its limitations is questioned." It would appear to me that Mr. Stetson should have written this first, studied it well and I do not think he would then have written the criticism. In his analysis of this problem he has entirely ignored the action of the springs with which our modern rolling stock is almost universally equipped.

J. G. SULLIVAN,
Assistant Chief Engineer, Canadian Pacific Railway.

New York, January 11, 1909.

To the Editor of the Railroad Age Gazette:

In the discussion of "Flat spots on car wheels" by Messrs. Benjamin, Stetson and Fowler in various issues of your paper, and of Messrs. Vaughn and Spilsburg in the *American Engineer*, it will be noted that such mathematical treatment as the subject there receives can apply only to an absolutely rigid rail surface, and would, I believe, be untrue under actual operating conditions.

In actual operation the wheels are always running up hill, due to the vertical curvature of the rail against the wheel contact, and the recoil of the rail counters against any decrease of wheel pressure by following the wheel in any upward movement; in other words, the rail will not allow the wheel to get away from it; the conserved energy of the body-carrying springs assists the rail in maintaining this contact.

The upward curvature of the rail is also influenced by the other pair of wheels in the same truck, whether they lead or trail, and doubtlessly also by the wheels of the next leading or trailing truck (reference is here had to the short wheel base of freight car equipment), for the rail practically acts as a continuous girder, except when the wheels under discussion are near the rail joints, and are subject to the vertical wave movement of such girder. Any one who has ever stood as close as possible to a railway track during the passage of either high-speed or slow-moving traffic will have noted the perceptible vertical movement not only of the rail and tie (the elasticity of the different tie woods may materially affect this) but also of the rail flange under the spike heads; the relation of the rail surface to the wheel contact is to all intents a combination of cycloidal and sine curve movements. Of one thing we are quite certain that once a flat spot, always a flat spot; it will round off somewhat at the ends but never disappear. If the wheel left the rail during the period of flat spot contact, the subsequent contact shock of the trailing edge of the spot would most likely lead to badly shelled out conditions at that point—conditions which as a rule do not prevail to a very great extent in practice.

The proof or disproof of the mathematical treatment this subject has received could perhaps be arrived at by some sort of electric indicator attached to the pair of wheels in question, which would indicate an open circuit when wheel-rail contact was broken. The testing machine as proposed by Prof. Benjamin in your November 27th issue would hardly meet the actual operating condition for the reasons herein stated.

S. F. PRINCE, JR.

Contributed Papers.

THE SLIPPING POINT OF ROLLED BOILER TUBE JOINTS.*

When a tube has started from its original seat the fit may be no longer continuous at all points and a leak may result, although the ultimate holding power of the tube may not be impaired. A small movement of the tube under stress is then the preliminary to a possible leak, and it becomes of interest to know at what stress this slipping begins. A knowledge of the slipping point of a tube in its relation to the ultimate holding power is somewhat analogous to a knowledge of the elastic limit of materials in relation to their ultimate strength, in that working stresses should be kept within the smaller values. There is then a considerable field for improvement in which to raise the slipping point to a higher per cent. of the ultimate strength of the joint or of the elastic limit of the tube. The usual design seems sufficient for most cases, but where high pressures are used or where the stresses due to temperature variations are large, a joint with a higher initial slipping point seems necessary. In attempting to strengthen the usual joint it might appear that harder rolling of the tube would raise this slipping point, but experiment does not show this. Harder rolling within certain limits will raise the ultimate holding power, but has little effect on the initial slip. The recommendation to flare the projecting end of the tube has high authority and is of value, but while this raises the ultimate holding power it does not alter the original slipping point. It seems evident that this flared portion would have to be moved into the hold before its metal could come into play, and this initial movement might be the cause of leakage. Evidently the point of initial slip has not been greatly influenced by the flaring of the ends, though it is probable that a tube drawn into a hole would be less likely to leak if flared. To discover a more rigid type several forms of tube openings were tested. If the holes into which the tubes are rolled are tapered $^1/_{10}$ in. in diameter per inch in thickness of the plate, the first slipping point is hardly affected, but the joint is more rigid after a slip of $^1/_{100}$ in. and the ultimate strength is increased.

During the progress of these experiments a form seemed wanted, to put the rolled metal under an initial stress in the direction of the axis of the tube, thus reinforcing the frictional resistance and making movement unnecessary to develop a larger resistance to the first slip.

In Fig. 3 Nos. 36, 44, 26, 25, 38 and 37 had double taper. Compared with the straight holes, the general effect was to lower the slipping point somewhat, but increase the rigidity. Two such tubes were tested by fluid pressure, the tubes having

Form of Joint.		Test No.	Load in pounds at point of Initial Slip	Load in pounds at point of Slip = 1/100 inch	Load in pounds at point of Ultimate Load	Slip in inches at point of Ult. Load
Tube Sheet 1" thick.						
Straight and Tapered.	Taper per inch .06	1	7800	8000	8400	.02
		2	7800	9500	11400	.05
		7			17200	.12
Flared, Straight and Tapered.	.06	4	6000	10300	11500	.07
Flared, Chamfered, Straight and Tapered.	.06	5	4000	7600	15000	.06
Tapered and Straight.	.06	3	7000	7800	26000	.112
Double Taper.	.10	8	15000	17500	30000	.04
		9	14500	15500	21000	
Tube Sheet ⅝" thick.						
Straight.		11	5000	6100	6400	.03
		15	4500	7000	9500	.04
		16	3700	5900	17000	.088
Punched.		18	8000	14700	17000	.044
Double Taper.	.10	23	6500	12000	16000	.04
Tube Sheet ½" thick.						
Straight.		10	2000	3600	7400	.03
		14	2000	6900	9500	.035
		17	3000	6000	20000	.06
Punched.		19	10000	17200	17500	.022
		20	3500	17000	23000	.036
Double Taper.	.10	22	7000	15000	27000	.048
Tube Sheet ⅜" thick.						
Straight.		12	1300	7000	18000	.045
Punched		21	8000	15200	16500	.027

Fig. 1—Results from Tests of 3-in., 12-Gage Cold-Drawn Boiler Tubes Rolled Into Various Forms of Tube Openings.

1 in. bearing in malleable boxes of the form used in the Parker boiler. The combination of tubes, with closed ends, and the box were filled with oil and an accurately ground plunger forced in under the testing machine.

A study of the several tests made shows that in the usual machined joint the resistance to the first slipping comes from friction only. The friction is dependent on the normal pressure of the expanded tube against the sheet, and this will be a maximum when the rolled metal of the tube is stressed to its elastic limit. The rolling of the metal elevates the elastic limit, but it takes a small amount of rolling to reach this maximum value. Further rolling reduces the thickness of the metal in play as fast as the elastic limit is exalted.

Assuming the elastic limit of the rolled metal at from 30,000

*Abstract of paper by Professors O. P. Hood and G. L. Christensen, Houghton, Mich., presented at the December, 1908, meeting of the American Society of Mechanical Engineers.

to 40,000 lbs., the observed slipping point shows that the coefficient of friction must have been 35 to 26 per cent. The total friction per square inch of tube-bearing area seems to be about 750 lbs. in the tube plates ⅝ and 1 in. thick. It was observed that in straight and tapered holes wherever a high final strength was attained the metal of the tube was in some way abraded. Sometimes the sharp edge of the tube plate would shear a small ring from the metal of the tube and in other cases patches of the metal had apparently seized and sheared. Computing the probable frictional resistance of these joints and adding the resistance of the sheared area shown on the tube gave a result agreeing closely with the observed ultimate strength of the joint as tested.

Most of these joints also showed a relatively high slipping point, suggesting the necessity of providing shearing resistance in addition to frictional resistance in order to obtain a high resistance to initial slip. Several forms were therefore made which provided square shoulders in the tube sheet for the tube to be rolled against, with the object of making these several edges abrade the tube when it started to move. This serrating of the holes amounts to but little more than "a rough cut" in machining. Figs. 1 and 2 give the significant results obtained in several series of tests. Fig. 3 shows the behavior of the tubes of each type up to a slight slip, thus showing the raising of the slipping point by the several methods.

Form of Joint			Test No.	Load in pounds at point of Initial Slip	Load in pounds at point of Slip = 1/100 inch	Load in pounds at point of Ultimate Load	Slip in inches at point of Ult. Load
Tube Sheet 1" thick							
1"			12	7000	11500	17700	.085
			24	6000	7000	20000	.12
			27	9000	9500	21000	.10
			32	6400	6000	6400	–
Straight Machined Hole.			34	6800	10500	11800	.035
			35	8800	11200	18400	.105
Average				7333	9283	15833	.089
5" Taper ⅛" in diam. per inch			25	3500	14000	23000	.08
			26	5500	12800	19700	.047
			36	8200	12600	16500	.042
			37	7500	8900	23000	.178
Double Taper.			38	7000	10300	25000	.124
			44	7500	14400	33000	.060
			6	8500	12200	32000	.133
Single Taper			39	13500	17500	22600	.254
Average				7650	12837	24350	.128
	Serrations Number per inch	Depth in inches					
	10	.005	45	10000	15500	15800	.015
	10	.010	46	22000	27500	27500	.008
	10	.015	47	45000	50000	50000	.012
Serrated.	10	.020	48	43000	45000	45000	.003
	10	.018	33	23000	37500	37700	.012
	10	.015	40	25000	35000	35000	.01
	10	.007	41	16500	23800	24200	.015
	16	.007	43	21000	27200	27200	.006
Serrated.	64	.002	42	15000	16000	16000	.010

Fig. 2—Results from Tests of 3-in., 12-Gage Cold-Drawn Boiler Tubes Rolled Into Various Forms of Tube Openings.

To discover how much roughening was desirable a series of tests were made with straight holes, in which a shallow square thread was cut with a pitch of ten threads to the inch and from 0.005 to 0.020 in. deep. The tube ends were not flared. Nos. 45, 46, 47 and 48, Fig. 3, show the results from these serrated holes, in which it appears that the slipping point may be very greatly elevated by this means.

With serrations 0.005 in. deep the surface is barely roughened, and the slipping occurs at 10,000 lbs. This is increased successively to 16,200, 22,000 and 45,000 lbs. by increasing the depth of the grooves to 0.007, 0.010 and 0.015, in., respectively.

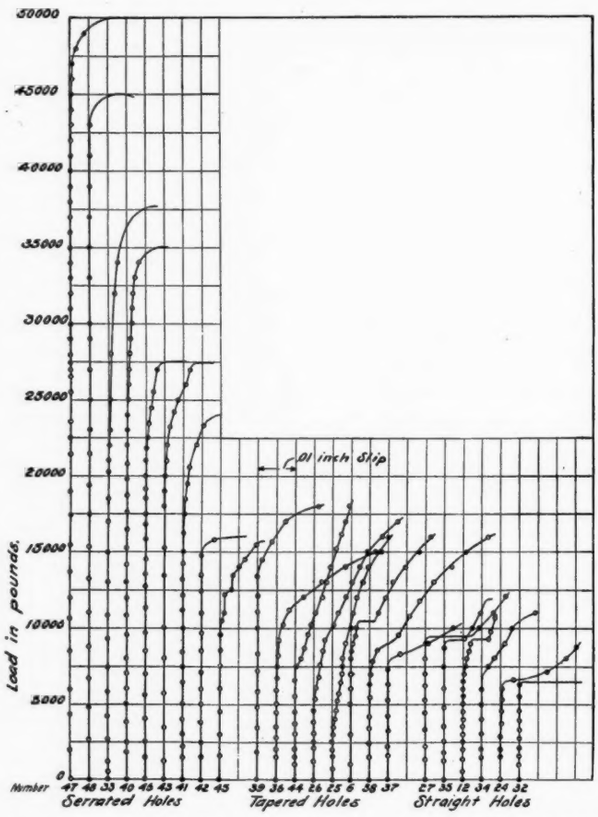


Fig. 3—Load Slip Diagram Showing Initial Slip of 3-in. Tubes, Grouped According to Type of Tube Hole.

The elastic limit of the tube is reached in tension at about 34,000 lbs., and this load was exceeded by a number of the tubes before there was any slip.

In test 41 the hole in the tube sheet was serrated by rolling with an ordinary flue expander, the rolls of which were grooved 0.007 deep and 10 grooves to the inch. This method of serrating is easy and can be recommended where tubes are giving trouble from slipping and are required to carry an unusual load. This tube has the slipping point raised to three or four times the usual value. It appears that with serrations about 0.015 in. deep, giving an abutting area of about 1.4 sq. in. in a seat 1 in. wide, that the maximum strength is reached, as shown in tube 47.

ANNUAL GOVERNMENT REPORT OF RAILROAD RECEIPTS AND EXPENSES.

The accompanying table, issued with the annual report of the Interstate Commerce Commission (which was given in our last issue), shows the annual financial satement more in detail; and, for the first time, gives the figures for each month separately.

The reader is reminded that the classification of accounts prescribed by the commission embraces changes from the previous practice of carriers in keeping their accounts which

RECEIPTS AND EXPENSES OF STEAM RAILWAYS IN THE UNITED STATES, YEAR ENDING JUNE 30, 1908.

Item.	Number of roads repre-sented.	Mileage operated at end of month.	Operating revenues.					Operating expenses.							Net operating revenue.	Taxes.	Operating income.	Ratio of operating expenses to operating revenues.
			Freight revenue.	Passenger revenue.	All other revenue from transportation.	Revenue from operations other than transportation.	Total.	Maintenance of way and structures.	Maintenance of equipment.	Traffic expenses.	Transportation expenses.	General expenses.	Total.				
		Miles.																*Per cent.*
July, 1907, total	794	223,938.86	$155,015,717.17	$50,740,755.49	$14,830,104.48	$2,367,055.50	a $223,953,632.64	$33,291,446.71	$35,771,157.20	$4,317,566.03	$75,575,139.49	$4,464,192.89	b $154,020,056.35	$69,933,576.29	$6,795,641.97	$68,150,700.57	67.27
Per mile of line			692.19	226.57	66.24	10.57	995.57	148.63	159.72	19.28	337.45	19.93	687.72	312.34	30.34	304.30	
August, 1907, total	790	224,560.17	193,054,966.03	61,879,018.36	14,641,145.29	2,346,424.17	c 241,927,208.35	34,832,567.21	36,596,726.15	4,176,788.83	77,119,892.38	4,462,226.13	c 157,761,701.13	84,165,507.22	6,881,616.44	77,283,890.78	65.21
Per mile of line			726.11	275.55	65.20	10.45	1,077.34	155.11	162.97	18.60	343.43	19.87	702.54	374.83	30.64	344.19	
September, 1907, total	782	224,744.90	169,694,225.12	57,534,215.26	14,256,161.83	2,126,842.62	d 234,607,549.18	34,155,840.58	36,003,023.70	4,238,658.00	77,734,092.92	4,595,803.47	d 157,266,042.50	77,341,506.68	6,805,872.14	70,535,634.54	67.03
Per mile of line			755.12	255.98	63.43	10.45	1,044.98	152.00	160.19	18.80	345.88	20.45	699.75	344.13	30.28	313.85	
October, 1907, total	776	225,216.74	180,467,548.15	62,957,696.60	15,308,294.34	2,225,962.46	e 250,959,501.55	35,488,103.58	38,938,310.83	4,408,122.89	83,708,710.30	4,738,201.94	e 167,945,749.71	83,013,751.84	7,088,825.19	75,941,577.79	66.92
Per mile of line			801.31	279.56	67.97	9.93	1,114.38	157.57	172.98	19.58	371.68	21.04	746.11	368.59	31.48	337.19	
November, 1907, total	772	225,668.28	158,116,060.82	45,787,730.69	14,671,177.80	2,237,626.92	f 220,812,596.23	29,377,922.45	35,460,888.31	4,020,319.07	80,896,966.61	4,680,462.89	f 155,117,131.17	65,704,207.41	6,912,708.77	58,788,798.64	70.25
Per mile of line			700.69	202.91	65.01	9.92	978.53	130.19	157.14	17.82	358.49	20.74	687.40	291.15	30.63	260.52	
December, 1907, total	776	225,359.12	132,482,771.44	45,720,398.54	14,237,862.99	2,276,749.54	g 194,737,782.51	23,744,737.96	32,786,174.44	3,985,911.61	77,237,845.29	5,156,975.53	g 143,515,038.37	51,222,743.66	6,949,013.71	44,373,292.95	73.70
Per mile of line			685.28	201.98	63.16	10.06	960.50	105.36	145.48	17.68	342.52	22.88	636.91	227.26	30.83	196.83	
January, 1908, total	763	226,779.94	118,501,201.00	40,231,491.66	12,686,848.41	2,154,753.52	173,574,294.59	21,186,267.96	29,736,214.92	3,951,686.79	72,730,908.65	4,830,214.46	h 132,998,391.55	40,575,903.04	-6,782,058.83	34,123,844.47	76.69
Per mile of line			522.54	177.40	55.93	9.50	765.37	93.42	131.12	17.43	320.71	21.30	586.47	178.93	29.91	150.47	
February, 1908, total	779	227,017.43	110,867,222.36	36,105,155.83	12,507,968.16	1,787,328.45	161,268,574.80	19,020,725.57	27,480,414.66	3,807,322.50	68,931,928.01	4,590,960.20	i 124,391,193.80	36,877,379.10	6,816,363.39	30,061,015.71	77.13
Per mile of line			488.37	159.03	55.10	7.87	710.38	83.78	121.06	16.77	303.66	20.23	547.91	162.44	30.03	132.41	
March, 1908, total	774	226,838.46	128,314,998.93	40,195,956.53	13,433,215.45	1,831,515.22	183,785,686.43	20,878,254.81	28,186,274.85	3,820,038.32	70,902,543.48	4,603,273.58	n 128,994,064.16	54,801,932.27	6,993,964.47	47,940,211.33	71.34
Per mile of line			565.62	177.19	59.30	8.07	810.18	92.03	124.25	16.84	312.54	20.29	568.61	241.57	30.24	211.33	
April, 1908, total	774	227,382.07	119,127,234.18	41,013,075.04	13,351,617.09	1,987,593.63	o 175,099,519.95	24,200,357.32	26,041,154.01	3,835,226.24	65,768,772.94	4,535,674.09	p 124,913,605.98	50,182,431.51	7,074,027.07	43,108,404.44	71.34
Per mile of line			523.85	180.34	58.72	8.74	770.05	106.42	114.53	16.87	289.21	19.94	549.35	220.70	31.11	189.59	
May, 1908, total	776	227,239.16	116,638,371.25	42,750,376.05	13,478,446.82	1,679,101.91	q 174,554,216.03	26,387,874.50	24,612,568.64	3,819,931.67	64,657,259.42	4,694,282.32	q 124,662,548.16	49,991,827.71	7,101,318.99	42,889,978.72	71.36
Per mile of line			513.28	188.13	59.31	7.39	768.15	116.12	108.31	16.81	284.54	20.23	548.16	219.99	31.25	188.74	
June, 1908, total	769	227,678.06	121,940,194.45	45,999,333.57	14,125,051.19	2,047,594.01	r 184,018,230.78	29,297,668.56	20,573,997.83	4,018,661.18	64,477,978.12	4,749,448.88	r 123,615,916.43	52,402,314.38	7,021,874.07	52,480,440.28	67.18
Per mile of line			535.58	201.99	62.04	9.00	808.24	128.68	90.36	17.65	283.20	20.86	542.94	230.50	34.80	265.39	
Total for the year			1,665,119,841.89	566,905,106.78	167,873,794.77	24,687,932.37	s 2,424,640,637.01	331,831,543.87	372,299,062.54	46,490,035.92	879,757,247.61	55,092,068.93	t 1,685,101,878.53	729,538,728.49	83,860,516.41	645,678,242.07	69.91
Per mile of line			7,363.84	2,507.09	742.40	109.18	10,722.75	1,467.58	1,646.11	214.05	3,890.65	246.06	7,496.43	3,226.22	370.97	2,855.45	
Ratio to total operating revenues (per cent)			68.68	23.38	6.92	1.02	100.00	13.69	15.35	2.00	36.28	2.31	69.91	30.09	3.46	26.63	

a Includes $6,775.23 unclassified.
b Includes $515,363.39 unclassified.
c Includes $1,703,324.83 unclassified.
d Includes $643,329.04 unclassified.
e Includes $6,104.35 unclassified.
f Includes $7,033,583.53 unclassified.
g Includes $1,704,388.54 unclassified.
h Includes $573,571.45 unclassified.
i Includes $6,042.35 unclassified.
j Includes $590,542.34 unclassified.
k Includes $1,703,731.44 unclassified.
l Includes $4,600,088.77 unclassified.
m Includes $553,844.76 unclassified.
n Includes $318,029.42 unclassified.
o Includes $1,703,731.44 unclassified.
p Includes $517,527.39 unclassified.
q Includes $7,924.00 unclassified.
r Includes $590,706.98 unclassified.
s Includes $1,703,731.44 unclassified.
t Includes $468,161.80 unclassified.
u Includes $53,699.20 unclassified.
v Includes $6,760,519.66 unclassified.
w Based on 226,121.10 miles, average mileage operated during year.

impair the basis of comparison between the reports made for the year ending June 30, 1908, and the reports of previous years. The principal changes were the exclusion from operating expenses of charges for additions and betterments to way and structures and the inclusion in operating expenses of formal depreciation charges. It is necessary in making comparisons to make proper allowance for these differences in classification.

ELECTRIFICATION OF MELBOURNE SUBURBAN LINES.*

BY CHARLES H. MERZ, M.INST.C.E.

X.

The distribution of energy from the sub-stations to the motors on the trains will be by means of a contact, or conductor, rail, the circuit being completed by the track rails which will be rendered electrically continuous for the purpose by bonding at the joints. The conductor rail itself should be of a special composition of steel in order to reduce the electrical resistance to a minimum.

The specifications cover the supply and delivery of material only, as in my opinion all the work on the ground can be carried out with advantage by the railway department.

The collection of current from the conductor rail is by means of a contact shoe attached to the bogie trucks, and this may be of either the under, over, or side contact type. The decision as to which of these alternatives should be adopted depends on the exact design of protection. On the accompanying drawing two of the rails shown are for under contact shoes and one for top contact shoes. Whilst I was in Melbourne some samples of typical forms of protection were made and erected on the track and it was decided to leave these exposed to the atmosphere for a considerable time before coming to a final decision as to the best form of protection and kind of wood to adopt. I also had sent here, for tests in my laboratory, samples of various woods, which it would be possible to use for this protection and, although it seems certain that "messmate" gives the best result electrically, I withhold my decision as to the exact design of protection for the time being until I hear how the samples erected in Melbourne have stood the effect of sun and weather and also until the laboratory tests being made here are completed. The estimates, however, allow for the adoption of any of the types shown, and the specifications provide for the supply of rails, insulators, and bonds of such design that the conductor rail may be completely protected throughout its length.

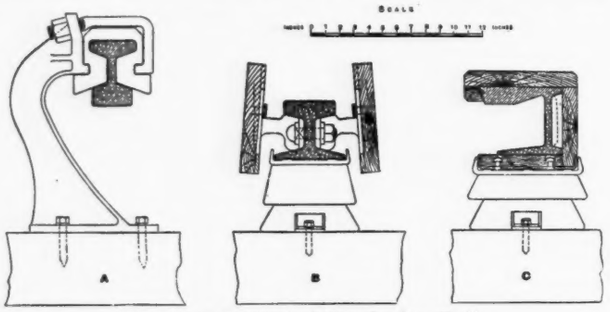
On double track roads the conductor rails for both tracks will be laid in the six-foot way, thus leaving the tracks themselves, and the outside of the tracks, free from obstruction. Where there are level road crossings or special track work, such as cross-over roads or junctions, the conductor rail will be discontinued and the gap bridged by lengths of low tension cable laid underground, the supply and delivery of which is included in Specification No. 8 covering all cable work. An accompanying drawing shows the normal position of the conductor rail relative to the track rails.

The bonds will be placed under the existing fishplates, firstly to reduce the length and, therefore the cost as much as possible, and secondly, to protect the bonds against mechanical injury. For the 100-lb. rails, and for a large portion of the 80-lb. rails, this arrangement of joint bonding can be adopted without alteration to the standard fishplate. In the case of some of the lighter fishplates, however, some machining of the plates will be necessary and has been allowed for in the estimates. Cross bonds will also be provided at intervals between the two rails of the same track and between different tracks,

*Abstract of the Report to the Victorian Railways Commissioners on the application of Electric Traction to the Melbourne Suburban Railway System. Published by the courtesy of the commissioners.

so that, in the event of any repairs being carried out, there may be no danger of the electrical circuit being broken; this also provides against open-circuiting in the event of failure of the bonding in one or more lines of rail.

In order to give the operating staff complete control of the track circuits, it is proposed to instal section switches in the signal boxes at all junctions and, where the length between junctions justifies it, at intermediate boxes. These switches will be operated by the signalmen on duty. The telephone circuits provided for throughout the route will be looped in at all signal cabins so as to place the signalmen in direct communication with the sub-stations supplying the power to the particular sections which they control. It is, of course, only necessary for the signalman to operate these switches occasionally.



Types of Protected Conductor Rail.

The supply and erection of these switchboards is covered by the specification for sub-station equipment.

The laying of the conductor rail in the position shown will necessitate the reconstruction of a certain number of bridges in order that there may be ample clearance between the rail and these structures. I have obtained from the engineer of way and works an estimate of the cost of this work, and this estimate is included in the cost of the electrical equipment. The bridges which have to be altered are largely of an old pattern, and a proportion of them will have to be replaced if steam working be continued, as they are hardly suitable for carrying as heavy locomotives as you will require in the near future for country service on some of the lines in question. I have also included an ample allowance for the extension of those sleepers on which insulators will be placed for supporting the conductor rail, and any moving of signal rods and wires that may be necessary; my estimates are based on Australian conditions and on prices obtained while in Melbourne.

The accompanying table gives my estimates of the capital cost of the track equipment, the permanent way alterations, and the low tension cables necessary to connect up the sub-stations and section switches to the conductor rail and track.

The estimates include freight tariff, engineering and contingencies.

Capital Cost of Track.

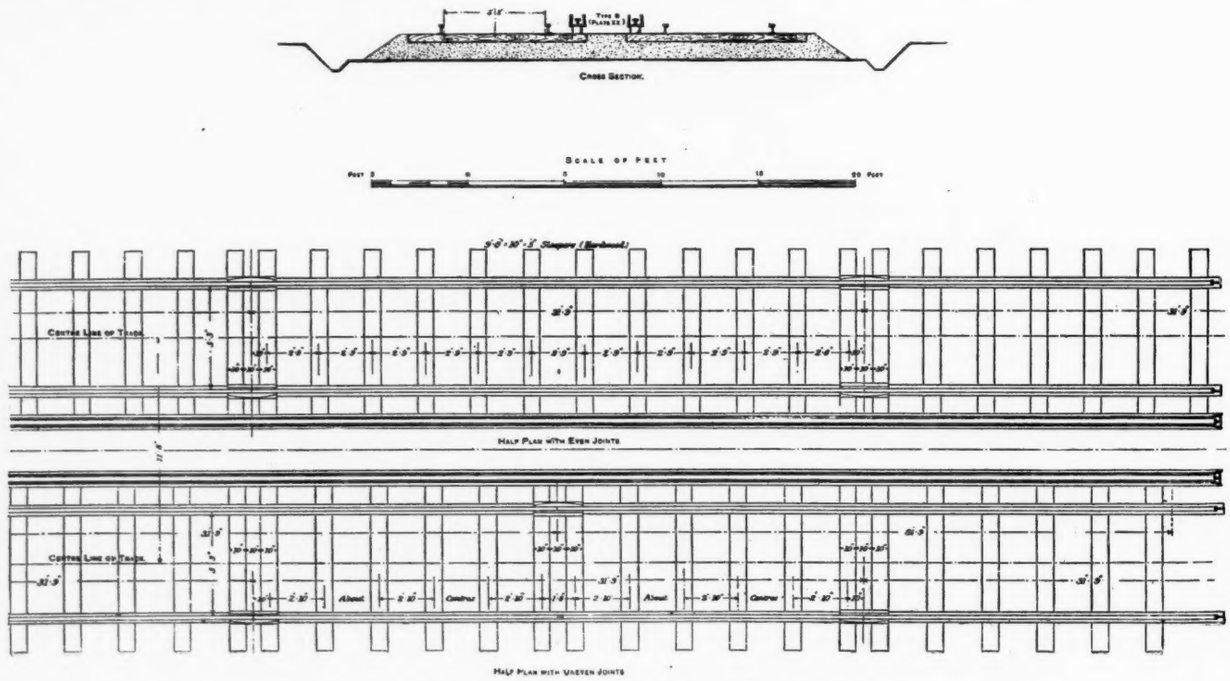
	Pt. Melbourne & St. Kilda branches.	Stages I.	II.	III.
1. Conductor rail*	£22,370	£102,045	£211,225	£400,515
2. Track bonding	2,523	11,580	23,514	44,989
3. Section switchgear and all low tension cables	8,355	12,510	18,030	25,689
4. Alterations to fishplates, sleepers, signal gear and bridges	19,656	43,397	57,087	95,429
5. Spare material.†	426	796	1,179	1,526
Total	£53,330	£170,328	£311,035	£568,139

*Including all "special work," bonding, protection and cable work.
†As the material required in connection with the track work can all be standardized, and as the different items themselves include a considerable margin, I have not allowed for any very large amount of spare material.

As already mentioned when discussing the choice of system, the inspection and maintenance of the track equipment can be efficiently dealt with by the present permanent-way inspectors. The renewal of bonds and insulators can be carried out by the existing staff, but in order to deal with cable work, it will be necessary to keep one or more cable jointers, according to the number of lines in operation. I have allowed in my estimates for the additional labor and material based on my experience of the cost of similar maintenance work elsewhere, but increased to cover the higher cost of labor in Victoria. The following figures for annual cost of maintenance of electrical track equipment, including material, are based on the mileage proposed to be equipped under each stage, being practically independent of the number of train-miles operated over the section.

Port Melbourne and St. Kilda Branches	£720
Stage I.	3,300
" II.	6,700
" III	12,800

(To be continued.)



Proposed Location of Conductor Rail.

RIO CONCHOS BRIDGE OF THE KANSAS CITY, MEXICO & ORIENT.

BY W. W. COLPITTS, M. A. S. C. E.
Assistant Chief Engineer, K. C., M. & O. Ry.

The main line of the Kansas City, Mexico & Orient Railway crosses the Conchos river, the principal stream of Northern Mexico, at a point 141 kilometers east of Chihuahua. The head waters of the stream are in the Sierra Madre mountains and above the site of the Orient's crossing. It drains a watershed of about 20,000 square miles. This watershed varies from mountainous to hilly and the run-off during the rainy season is very rapid, the water sometimes rising ten feet in a few hours, at such times flowing at the rate of about ten miles an hour. The railway bridges the stream at a point where the channel is about 650 ft. wide and about three feet deep at low water.

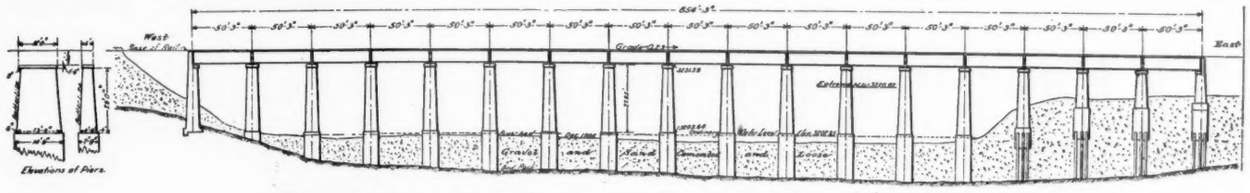


Fig. 1—Kansas City, Mexico and Orient, Conchos River Bridge.

The piers and abutments of the bridge are founded on a comparatively hard gypsum rock, varying in depth below low water from zero at the west side to 19 ft. at the east side. Overlying the rock, in the order named, are strata of clay, cemented gravel, and gravel of varying thicknesses. An opening of 850 ft. was decided upon as necessary to provide sufficient water way during the flood stage, and in consequence, 200 ft. of the bridge extends over the flat on the east side of the river.

The bridge consists of 17 spans of 50 ft. deck-plate girders, supported on plain concrete piers and reinforced concrete abutments. In the case of the west abutment and the channel piers, the foundation was carried to rock. The three piers on the flat on the east side of the river and the east abutment are afforded good natural protection. They are supported on piles driven to rock, and cut off at the low water line, the concrete extending about 2 ft. below the tops of the piles.

The dimensions of the piers and the cross section of the river are shown in Fig. 1. The east abutment, Fig. 2, was originally planned to be similar to that of the west abutment, but the fact that more than half the bridge was built after the rainy season had began, and the probability of a flood occurring before its completion, made it imperative that a simpler type that could be more rapidly built be adopted.

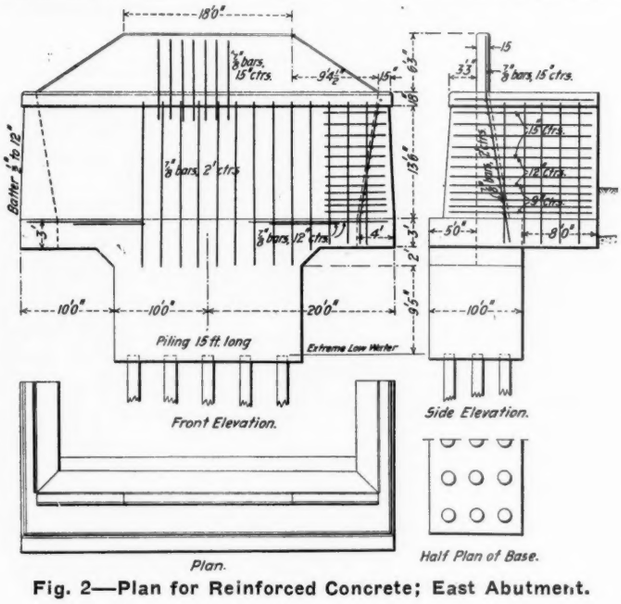


Fig. 2—Plan for Reinforced Concrete; East Abutment.

The west abutment, Fig. 3, is one of the standard forms of reinforced concrete abutments adopted by the railway company. The general characteristics of this type of abutment are given in a series of articles, by the writer, published in *The Railway Age* August 16 and August 23, 1907.

The construction of the bridge was begun from the west side on April 20, 1907. The foundation of the west abutment was above water and its construction was attended with no unusual difficulties. In the cofferdams for the foundations of the first eight piers, 12-in. steel sheet piling was used of the pattern manufactured by the United States Steel Piling Company. The pile driver was supported on heavy horses, and a two way cast iron follower block permitted of driving the piles in either direction. A 60-ft. x 20-ft. x 4-ft. barge supported a hoisting engine and a stiff-legged derrick. The engine furnished power for driving the sheet piles and also for operating a clam shell dredge suspended from the boom of the derrick. Upon the completion of a cofferdam the interior was dredged clean and an inside form of one inch lumber, of the neat dimensions of the base of the pier, was placed in position and braced against the sheet piling. The concrete was mixed on the river bank, by a Chicago cube mixer of ½ cu. yd. capacity, and carried to the cofferdam in dump buckets on push cars over a temporary track in the river bottom, which was extended as successive piers were completed. The buckets were lowered into the cofferdam by means of a mast and cross-head, and dumped upon reaching the bottom. The barge derrick was also utilized in placing the form for the shaft, and the same means were employed in

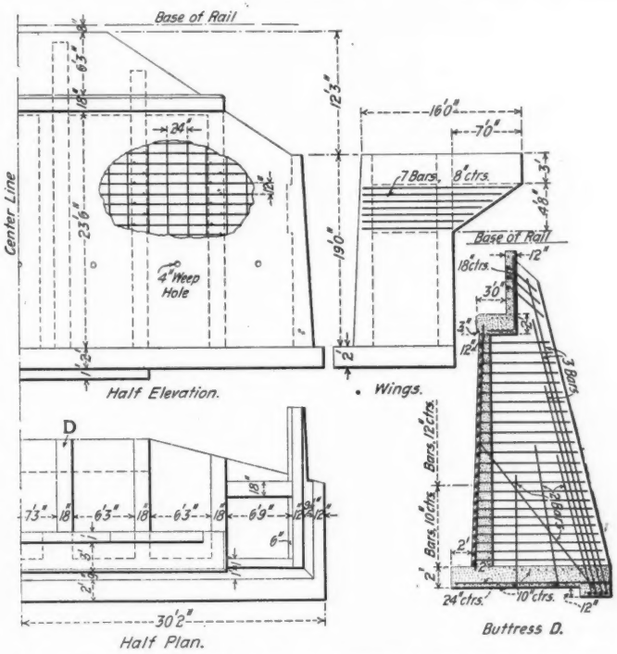


Fig. 3—Plan for Reinforced Concrete; West Abutment.

placing the concrete in the shaft form that had been used in the base.

The sand and gravel, both of which required screening, were obtained from a near by cutting and transported to the mixer on cars. Upon the completion of a pier the girders were set by means of a 15-ton derrick car, the bracing temporarily bolted in place, and the ties and rails placed on the span.

important to the Railway Company that the bridge be completed before the water rose and stopped operations.

It was evident from the rate of progress already made that unless some more rapid methods of construction were devised the work would be overtaken by freshets and the completion of the bridge delayed indefinitely. At this point the writer took personal charge of the work and it is the methods used in

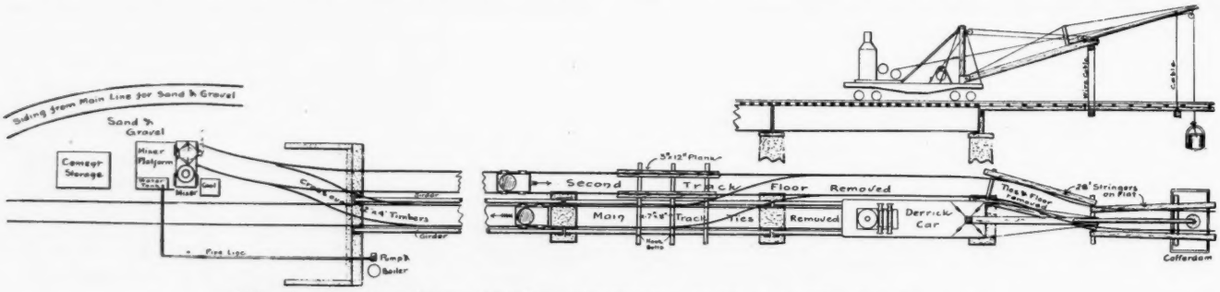


Fig. 4—Conchos River Bridge, Illustrating Method of Placing Concrete.

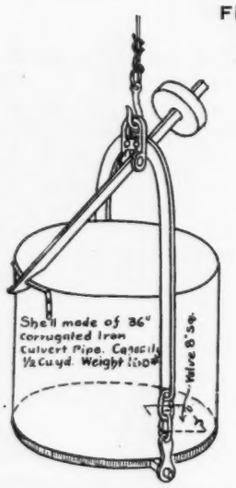


Fig. 5—Single Line Bucket for Depositing Concrete Under Water.

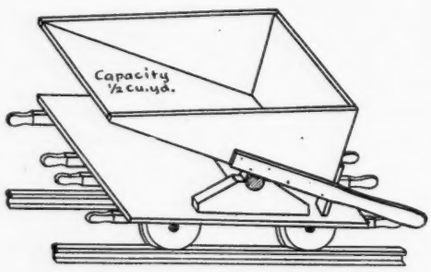


Fig. 6—Dump Boxes for Placing Concrete in Shafts of Piers.

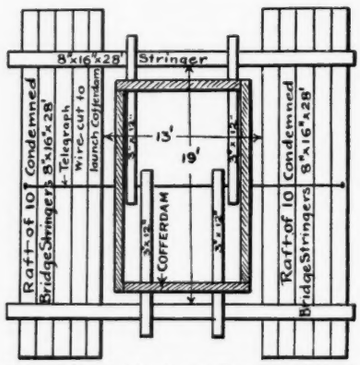


Fig. 8—Method of Erecting and Launching Cofferdams.

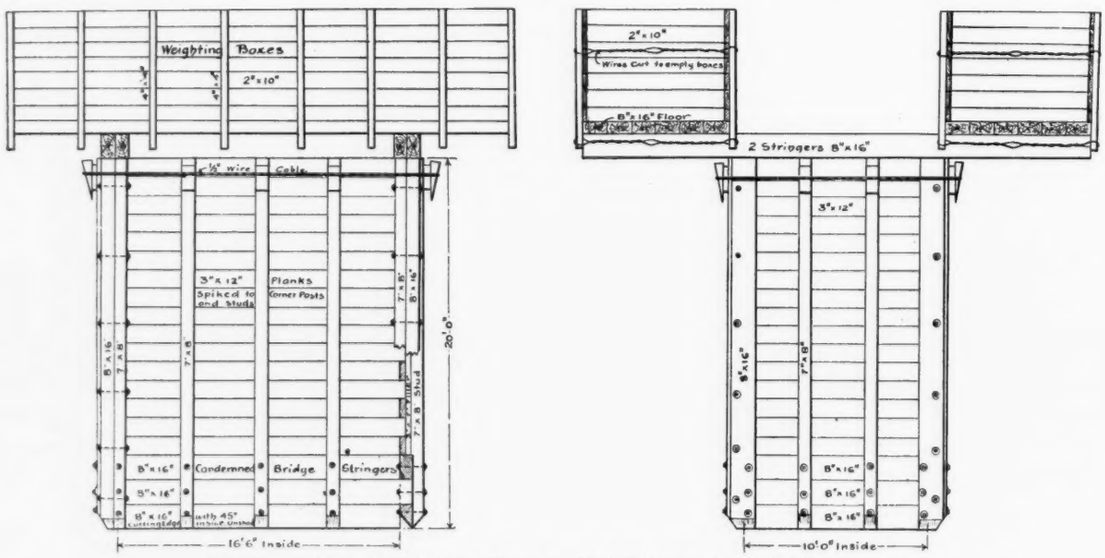


Fig. 7—Side and End Elevations of Cofferdam and Weighing Boxes.

The work was handled in this manner until May 1, 1908, at which time the west abutement and six piers were completed. The rainy season in Northern Mexico begins about the latter part of June, and minor floods may be expected in the larger streams at any time subsequently, and serious floods about the latter part of August. In order to handle the fall crops and other freight originating east of the river, it was completing the structure in advance of high water and the statement of cost that will be of special interest to construction engineers.

Some apology is necessary for the crudeness of some of the methods employed. On account of the distance of the work from a source of supply, machinery and materials could not be obtained in less than from four to six weeks. Skilled labor

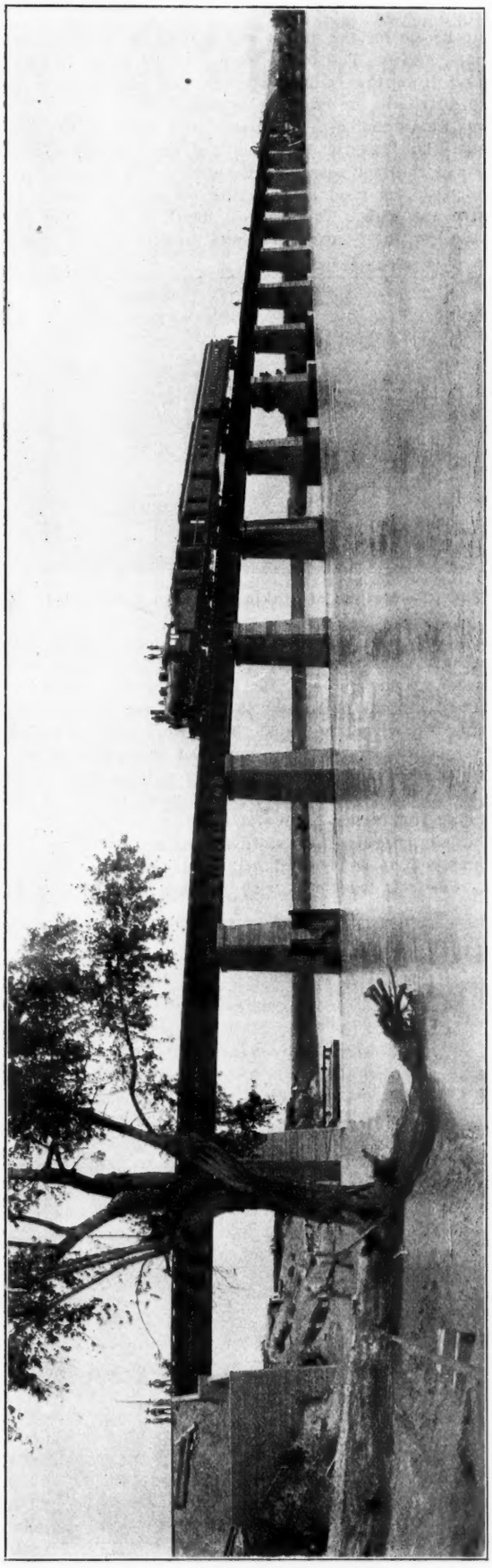


Fig. 9—General View of the Conchos River Bridge; Kansas City, Mexico and Orient.

of any kind was also difficult to obtain in a reasonable time. Consequently, any changes in construction methods, that involved the purchase of new machinery or other materials that must be obtained from the United States, would retard rather than advance the time of completion. The problem was one of reorganization and of the utilization of the machinery, materials, and labor available, to the best advantage. The existing organization was such that one part of the work had to await the completion of another, so that no two operations could be carried on at once. The driving of the sheet

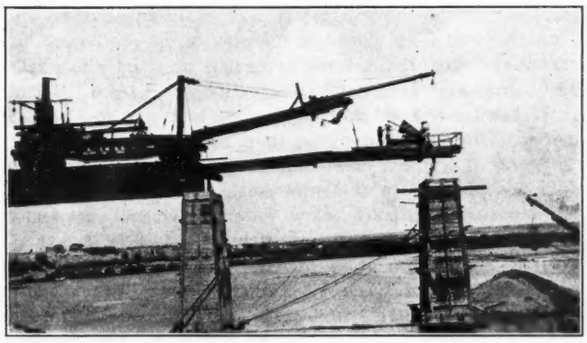


Fig. 10—Method of Placing Concrete in Shafts.

piling for one cofferdam occupied from a week to ten days, after which it was dredged out—an operation that consumed about two days more. The cemented gravel, through which the sheet piles were driven, was very hard and the piles were often badly battered and bent and their removal for use again after the completion of a pier frequently occupied more time than the driving.

The various changes in methods of construction were designed to minimize the time required for each operation and to permit several to be carried on simultaneously, and also to insure against loss or damage in case of premature high water. To guard against the latter, the temporary track in the river bottom was removed at once, and the following plan for placing the concrete put into effect, which proved both economical and rapid.

A second track, 8 ft. centres with the main line, was laid

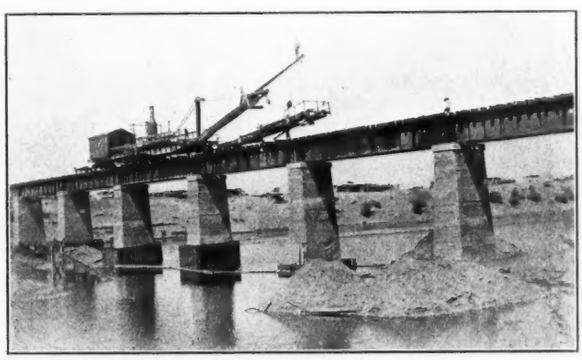


Fig. 11—Removing Extension Track.

on the bridge, as shown in Fig. 4. Twenty foot guard-rail timbers, 8 ft. centres, were placed between the main line ties and secured with hook bolts to the flanges of the girders. On the overhanging ends were placed two lines of 3 x 12 planks, 5 ft. centres, and on these the rails for the second track were laid. The concrete mixer was removed from its former position in the river bottom, and placed at the west end of the bridge in such a position that the second track on the bridge led directly from the spout of the mixer. A siding was laid to the mixer and the sand and gravel brought from the cutting on cars and unloaded near by. The cement was also stored

immediately behind the mixer. Water was provided by a pump on the river bank and piped to a tank at the side of the mixer. The boom of the derrick car was lengthened about 25 ft. and trussed with wire cables to support a load of four tons at its extreme end. From the boom was suspended, by wire cables, an extension to the second track, 60 ft. in length. This extension track was supported on four 28 ft. stringers with a reverse curve, which brought the centre line, at its outer end, concentric with that of the bridge and directly over the pier site. The extension track was supported from the boom at its outer end and at the middle, and upon a bent on the pier at the inner end. It was so arranged that when the concrete had been placed in the pier forms the boom could be raised and with it the track extension, and the whole taken off the bridge and the track extension detached from the boom by lowering it on to a side track and throwing off the cable supports. The derrick car was then ready for use in setting the girders. The track extension was as easily attached again for placing concrete in the next pier.

For depositing concrete below water, a bucket was devised to operate with a single line, as illustrated in Fig. 5. It was built of a 3-ft. section of 36 in. corrugated iron culvert pipe, having a capacity of ½ cu. yd. In the bottom, which was of wood, was a clap valve 8 in. square, opening upward. A 1 in. iron trunnion set 6 in. off centre, was secured to the bottom. A bale with chain hooks at its extremities was attached to the pile line of the derrick car which was led through a block at the end of the boom directly over the centre of the pier. To the top of the bale was pivoted a counter-weighted trip, engaging a lip on the side of the bucket. The bucket was carried on a push car and the mixer discharged directly into it. It was then run out to the end of the extension, the hooks of the bale slipped over the trunnions, the trip caught on the lip, the bucket raised, and the car pushed from under it. The bucket was then lowered and upon its weight being taken on the bottom the trip automatically released. As the bucket was slowly raised from the bottom it upset, the valve in the bottom opened and the concrete poured out without disturbance; its construction being such that it discharged toward the lowest point. Three buckets were used, one being dumped while two others were on their way to and from the mixer; the loaded car using the second track, the empty car returning on the main track.

The concrete for the shafts was carried in dump boxes on push cars, Fig. 6. The forms were securely wired to prevent distortion from the falling concrete and baffle boards were used to distribute the concrete uniformly.

It was found that detachable cast steel teeth on the lips of the clam shell greatly increased the daily capacity of the dredge and this fact suggested the advisability of doing away entirely with the steel sheet piling which had proven both expensive and slow. The greatest depth to rock was 19 ft. below the low water surface and was practically level over the

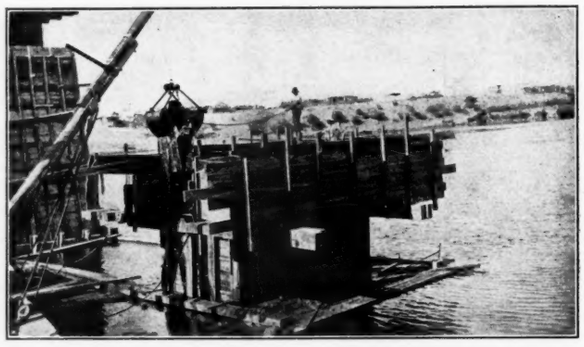


Fig. 12—Method of Sinking Wooden Cofferdams.

area of a pier. It was decided to sink open wooden cofferdams (Fig. 7), first dredging as deep as practicable in the open water at the pier site, the limit of which proved to be about 12 ft. In the meantime, the timber for the cofferdams was being framed on the bank. They were built as follows: The three bottom courses were composed of condemned bridge stringers, the lower one having a 45 deg. cutting edge, unshod. Above the stringers the sides were composed of 3-in. x 12-in. plank, spiked to corner posts and studs.

During construction the cofferdam was supported on a raft also composed of condemned bridge stringers, as shown in Fig. 8. The raft was built with an open bay, about a foot

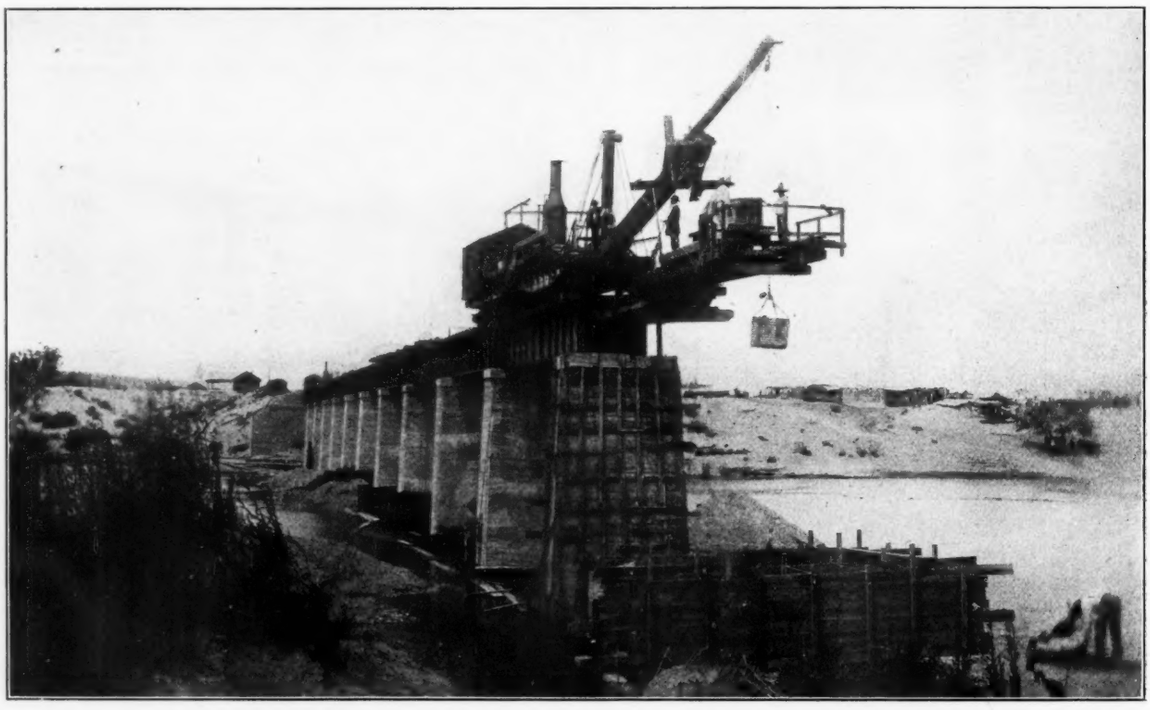


Fig. 13—Conchos River Bridge; Method of Depositing Concrete in Bases.

larger on all sides than the cofferdam. Across the center of the opening was stretched a heavy telegraph wire supporting the ends of four planks, the other ends resting on the raft. The lower courses of timbers of the cofferdam were then set in position on these planks and drift-bolted together. The position of the cofferdam on the planks was such that only a small percentage of its weight came upon the wire. The two other courses of stringers were then laid and bolted and the corner posts and studs bolted to these, after which the 3-in. planks comprising the balance of the sides of the cofferdam were spiked to the corner posts and studs. When completed, the wire was cut and the cofferdam launched into the water below, which, as stated above, had previously been dredged to a depth of about 12 ft. It was then guyed to its exact position and held level by lines from the boom of the barge derrick. Four posts or legs, with the lower ends resting on the bottom of the excavation, were spiked to the outside corners and all the guys removed, allowing the cofferdam to rest entirely upon these legs. To make provision for weighting the cofferdam while being sunk, stringers were placed across its ends and on the portions projecting beyond the sides, a floor of other stringers was laid and boxed up to a height sufficient to carry a load of about 75 tons of gravel each. The dredging operations were then begun and the material taken from the interior of the cofferdam placed in the boxes until they were filled. When the dredging had continued to a point where the bearing was uniform on the cutting edge of the bottom, the legs detached themselves from the sides and floated to the surface.

By carefully sounding the bottom and loading the boxes uniformly as the dredging proceeded, the cofferdam sank uniformly to the rock. The load was not removed from the boxes until the concrete had been placed, when by cutting the wires supporting the sides the gravel dropped into the water. The cofferdam was prevented from bulging when the concrete was being deposited, by means of a wire cable strung around the top and wedged taut at each of the studs. The derrick car was not removed from its position supporting the extension track until the concrete in both the base and shaft had been placed. The pile line of the derrick car was, therefore, available in removing the form on the shaft of the pier behind and erecting it on the recently completed base. The operation of filling it with concrete was then begun. While the work of placing the concrete in the base, erecting the form for the shaft, filling it and setting the girders was going on, the barge was employed in dredging for and sinking the next cofferdam, and in this manner the work proceeded until the thirteenth pier was completed.

The piles in the foundations of the three piers on the east bank of the river were driven with rail leads suspended loosely from the boom of the stiff-legged derrick, which had been removed and placed on skids on the bank. The forms were set and filled in the manner described.

The method of building the west abutment was as follows: Upon the completion of the excavation, the form was built up to a point 3 ft. above the bottom of the overhang. The piles were then driven and the back-filling completed up to the level to which the form had been built and care taken to tamp the filling solidly under the form for the overhang. The form was then filled with concrete to the top and the overhanging slab, which was 3 ft. thick, reinforced with steel to enable it to support the load of green concrete that would later come upon it. The form for the upper portion was then completed and the whole filled with concrete up to the bridge seat in two day's run. The west abutment was completed and the last span set on August 27, 1908, an average, after May 1, of one pier and span about every nine working days.

The statement of cost will be especially interesting to those who are familiar with conditions in the Republic of Mexico. Generally speaking, machinery, materials and supplies of all kinds are much more costly than in the United States, but this disadvantage is partly offset by cheap labor. The scale of wages (in U. S. currency) that prevailed on the work are given below:

General foreman	$150.00 per month
Sub-foremen	4.00 per day
Hoisting engineers	4.00 "
Firemen	1.50 "
Carpenters	1.50 "
Blacksmiths	2.00 "
Laborers (Peons)	.75 "

The cost of materials delivered at the work was as follows: Cement, $3.73 per barrel; form lumber, $23.33 per m.b.m.; steel reinforcement, $79.20 per ton; steel sheet piling, $54.15 per ton; bridge steel, $69.98 per ton; bridge timber, $36.65 per m.b.m.

In the statement below a proportion of the cost of all machinery and tools is charged against the bridge depending upon their condition and availability for future work.

STATEMENT OF COST.

SUBSTRUCTURE.

Abutments
Contain 586.2 cu. yds.

	U. S. currency.	Per cu. yd. concrete.
Material:		
Cement, 694.4 bbls., at $3.73	$2,590.11	$4.42
Sand, 263 cu. yds., at $0.50½	132.81	.23
Gravel, 526 cu. yds., at $0.50½	265.62	.45
Lumber, 22,232 ft., B.M., at $23.33	518.66	.88
Piles, 240 lin. ft., at $0.22	52.80	.09
Reinforcement, 41,730 lbs., at $3.96	1,632.51	2.79
Machinery, proportionate cost	59.21	.10
Wire and nails	101.50	.18
Lubricating oil	6.50	.01
Fuel	109.00	.18
Total material	$5,468.72	$9.33
Labor:		
Excavation for foundation	$199.66	$0.34
Building and removing forms	331.01	.57
Driving piles in foundation	67.77	.11
Placing steel reinforcement	92.55	.16
Mixing concrete	220.52	.38
Placing concrete	96.39	.17
Pumping water	18.74	.03
Cleaning and storing machines, etc	61.00	.10
Total labor	$1,087.65	$1.86
Total material and labor	$6,556.37	$11.19

Bases of Piers 1 to 16, Inclusive.

Bases 1 to 6 contain 373.0 cu. yds.
Bases 7 to 16 contain 887.7 cu. yds.
Total 1,260.7 cu. yds.

			Per cu. yd. concrete.
Material:			
Cement, 1,233 bbls., at $3.73		$4,599.09	$3.65
Sand, 591 cu. yds., at $0.50½		298.46	.24
Gravel, 1,182 cu. yds., at $0.50½		596.92	.47
Cofferdams of piers 1 to 6.			
Lumber, 3 M., B.M., at $23.33.	$69.99		
Steel sheet piling	924.72		
Wire nails and oil	53.00		
Machinery	817.00		
Fuel	700.00		
Material in cofferdams 1 to 6.	$2,564.71		
Per C. Y. concrete in bases 1 to 6, $6.88.			
Cofferdams of piers 7 to 16.			
Lumber, 26 M., B.M., at $23.33.	$606.58		
Piles in foundation	198.00		
Wire nails and oil	210.25		
Machinery	1,353.66		
Fuel	1,200.00		
Material in cofferdams 7 to 16	$3,568.49	6,133.20	4.86
Per C. Y. concrete in bases 7 to 16, $4.02.			
Total material		$11,627.67	$9.22
Labor:			
Mixing concrete		580.33	.46
Placing concrete		662.26	.52
Pumping water		38.00	.03
Cleaning and storing machines, etc		122.01	.10
Cofferdams of piers 1 to 6.			
Excavation	$857.22		
Driving sheet piling	1,653.17		
Pulling sheet piling	371.60		
Building inside forms	214.21		
Labor on cofferdams 1 to 6.	$3,096.22		
Per C. Y. concrete in bases 1 to 6, $8.30.			
Cofferdams of piers 7 to 16.			
Excavation	$1,010.05		
Piles in foundation	313.23		
Building and sinking C. dams	870.89		
Labor on cofferdams 7 to 16	$2,194.17	5,290.39	4.20
Per C. Y. concrete in bases 7 to 16, $2.47.			
Total labor		$6,692.99	$5.31
Total material and labor		$18,320.66	$14.53

Labor and material of cofferdams, 1 to 6 per cu. yd, concrete, $15.18
Labor and material of cofferdams, 7 to 16 per cu. yd., concrete, 6.49

Shafts of Piers 1 to 16, Inclusive.

Contain 1,357.2 cu. yds.

(The shafts of the piers did not differ appreciably in cost, and the statement is not divided as in the case of the bases.)

		Per cu. yd. concrete.
Cement, 482 bbls., at $3.73	$4,617.74	$3.41
Sand, 257 cu. yds., at 50½ cts.	321.69	.24
Gravel, 514 cu. yds., at 50½ cts.	643.38	.47
Lumber, 3,000 ft., B. M., at $23.33	163.31	.12
Machinery, proportionate cost	155.00	.11
Wire and nails	101.56	.07
Lubricating oil	28.50	.02
Fuel	919.00	.68
Total material	$6,950.12	$5.12
Labor:		
Building and removing forms	$582.55	$0.43
Mixing concrete	602.45	.45
Placing concrete	652.79	.48
Pumping water	39.00	.03
Cleaning and storing machinery	122.01	.09
Total labor	$1,998.80	$1.48
Total material and labor	$8,948.92	$6.60
Total cost of substructure	$33,825.95	$10.56

SUPERSTRUCTURE.

Steel Spans.—17 50-ft. Deck Plate Girders.

		Per ton steel.
Material:		
Steel, 611,734 lbs. f. o. b., New York	$16,822.68	$55.00
Freight and brokerage	4,582.08	14.98
Fuel, setting and riveting girders	181.36	.59
Total material	$21,586.12	$70.57
Labor:		
Unloading and setting girders	$294.45	$0.96
Riveting girders	640.35	2.09
Setting anchor bolts	105.00	.34
Machinery, proportionate cost	253.70	.83
Total labor	$1,293.50	$4.22
Total material and labor	$22,879.62	$74.79

Deck.—Ties L. L. P. 8-in. x 10-in. x 10-ft., spaced 13 in. centers; Guard rails L. L. P., 7-in. x 9-in. x 20-ft.

		Per M.B.M.
Material:		
62,401 ft., B.M., f. o. b., Safton, La.	$1,123.22	$18.00
Freight and brokerage	1,163.78	18.65
Fuel	25.50	.40
Total material	$2,312.50	$37.05
Labor:		
Framing and placing	$561.68	$9.00
Machinery, proportionate cost	60.63	.97
Total labor	$622.31	$9.97
Total material and labor	$2,934.81	$47.02
Total cost of superstructure	$25,814.43	.....
Total cost of bridge	$59,640.38	.....
The estimated cost of the bridge was	$63,015.00	.....

M. P. Paret was chief engineer and Geo. C. Maguire, resident engineer and general foreman.

WORK OF THE AMERICAN RAILWAY ASSOCIATION.*

BY W. F. ALLEN,
Secretary of the Association.

Unlike most of the others, this organization is not composed of persons, but of railway companies, who are represented at its meetings by any officer from president down. The only restriction is that no officer below the grade of division superintendent shall cast a vote without written authority from the ranking operating officer of the company. This association affords an opportunity for the officials of all branches of the operating department to meet together for the discussion of subjects of common interest. Any of them can address the chair or may be selected to serve on committees.

The facts relating to the formation of this organization are also quite different from those of the other railway associations, and present an interesting history of gradual, but constant, development from small beginnings.

When the practice of selling through tickets and running through cars over more than one road was first established, the necessity immediately arose for conferences, between the general managers or the superintendents of the connecting roads, about questions concerning the time-tables of these trains, and other subjects of mutual interest related thereto. When the officials of one important road desired to change its time-table, which they generally did each spring and fall, they would suggest to the officers of the other roads that a meeting for consultation should be held. Then, sometimes what were called "speed wars" would occur. A road running between two competing points would, without notice to the others, quicken the speed of one or more of its trains. Its rivals would retaliate by putting on still faster trains, when the first road would respond by still further increasing its speed, and so on. Having finally reached the limit of what was then considered safety, a convention would be called and articles of peace agreed upon. Finally, a general arrangement was entered into by the roads known as the "trunk lines" by which they agreed not to change time, nor to run any additional trains between competing points, without first conferring with each other. These conferences were known as "Time Conventions."

The earliest records of the meetings of these "Time Conventions," which I have been able to obtain any trace of, were those of May, 1872; although more or less sessions must have been held previous to that date. In April, 1875, a permanent secretary was elected. Since that date the records have been preserved and publishd in regular form. There were 36 delegates, representing 24 roads, present at the April, 1875, session.

The first organization embraced the roads from Boston, New York, Philadelphia, Baltimore and Washington, extending westward to Chicago, St. Louis, Cincinnati and Louisville.

In October, 1877, another "Time Convention" was organized, which included the lines leading southward from New York, Baltimore and Washington to New Orleans, to Jacksonville, Fla., and other intermediate points.

This convention chose the permanent secretary of the other organization as its secretary; and was called for want of a better name, "The Southern Time Convention."

These two conventions were consolidated in 1886, but that is anticipating. The event which directly led to this consolidation and to the subsequent career of the American Railway Association occurred in 1883. Prior to that date no subject had been acted upon by either convention, except the formation of the through time-tables and fixing the dates when they should take effect.

In 1881 a communication had been received by the General Time Convention, calling attention to the advisability of adopting a general standard of time-keeping in this country, but this was immediately referred without comment.

At that epoch the times of 53 different cities were used by the railways on their time-tables, and these times varied by all sorts of odd numbers of minutes.

A passenger between Boston and New York found that the published time-table referred to one time, as far as Providence, to another between Providence and Stonington, and to still another between Stonington and New York, the total difference being 12 minutes. The Fall River boats used New York time, and the Old Colony Railway trains, Boston time. Passengers coming from New York, who left the boat 10 minutes, by New York time, before the train was advertised to leave Fall River, found that it had gone two minutes before.

Similar conditions prevailed all over the country. This caused annoying confusion at points where roads running by different times connected with each other, and there were over three hundred such points.

Various suggestions had been made to remedy this situation, among others the divisions into zones, 15 minutes, half an hour, and one hour apart, but up to the time of the meeting of the General Time Convention in April, 1883, no definite plan had been proposed for putting any of these suggestions into effect, which the operating railway officials felt it was practicable to adopt.

At that meeting which was attended by the representatives of 30 companies, a detailed plan was presented, accompanied by an argument illustrated by maps, which led to its unani-

*From an address on "Railway Operating Associations," delivered before the Harvard School of Business Administration, January 11, 1909.

mous endorsement. One week later the same plan was presented to the Southern Time Convention, where 23 additional companies were represented, with the same result.

Arrangements were then made for the purpose of securing the assent of the other railways of the country to the proposed reform, and the result was to be reported at the next meeting of the Convention. When this time arrived, that is October, 1883, the managers of 78,000 miles of road had agreed to adopt "Standard Time," as proposed, and to put it into effect at the next change of time tables.

The new system was successfully inaugurated on Nov. 18, 1883. It is noteworthy that the reform thus accomplished was not preceded by executive or legislative action on the part of either National or State Governments. It was adopted by the people under the leadership of the railways and confirmative legislation followed in due course.

The success of this movement revealed to the railway managers the possibility of bringing about other reforms by the same methods, and of this they were quick to avail themselves.

The signals then used in handling trains, known as whistle signals, hand and lamp signals, and bell cord signals, had developed upon each road for itself without any semblance of uniformity, with one singular exception. Three whistles in all cases meant to back the train.

In 1881 a table was compiled showing the different whistle signals then in use and their number was found to be no less than forty. Again, motions made by the hand, or by lamp, conveyed one meaning on one road and another meaning on another road, and yet sometimes the trains of these roads used the same track for considerable distances and even occupied the same terminal station. So directly opposite were the meanings of the same signals on different roads, such, for instance, as the Pennsylvania and the Reading, that the officials of one road would not take into its service a man who had been employed on the other, for fear that he might at some time give the signal as used in his former employ and an accident follow.

This condition had existed from the time railways were first operated until April, 1883, when it was decided to appoint a committee of the "General Time Convention" to compile a code of uniform train signals. The report of this committee was finally acted upon at the session of October, 1884. It reduced the number of whistle signals from forty to twelve, and greatly simplified all the other signals.

In directing the movement of trains, rules for the government of employes are necessary. Those first compiled were crude and some of them quite curious, considered from the standpoint of to-day. For instance, on one of the early time-tables of the Baltimore & Ohio Railroad, provision was made for two trains to meet, when one was behind time, a certain number of hours. The other train had to remain at the scheduled meeting point until the specified hour arrived. Then each train was directed to send a brakeman ahead to confer and arrange between themselves how the trains were to proceed and pass each other. Naturally, the biggest and burliest brakeman secured the right of way for his train.

On another road there were, at one time, certain posts planted halfway between turnouts. Extra freight trains were instructed to proceed, looking for each other until they met. The one that had gone beyond the halfway post had the right of way, and the other one was obliged to go back to the siding it had just passed. That was simple. But men are ambitious, and sometimes in a hurry. So it frequently happened that one engineman would run his train at full speed so as to reach the halfway post first; so would the other one. It was not very long, therefore, before piles of wreckage marked the halfway points between stations, and that method of operating was abandoned.

That was before the time when the telegraph was introduced to direct the running of trains, and long before the necessities of the service had developed any form of block signal system.

The adoption of the Uniform Code of Signals led to another step forward. In October, 1884, a committee was appointed to compile a "Standard Code of Train Rules." Commenting upon this at the time the distinguished president of one of our most important railway companies said to me that he considered this proposition to be absolutely impracticable. Yet it has been since accomplished.

In the meantime, however, the desirability of a union of the two "Time Convention" organizations began to be mooted, and this was consummated in April, 1886. At that meeting definite Rules of Order were adopted and the form of organization of what is now known as the American Railway Association came into existence. The name of "General Time Convention" was retained, however, for five years, but in April, 1891, the present name was adopted.

A new committee on the subject of Uniform Train Rules, composed of representatives of both former conventions, was then formed. This committee took up its work most vigorously, and from the badly constructed and often discordant rules that preceded it formed an excellent Standard Code of Train Rules which each road could adopt, and which practically all have since adopted. This Code was first approved in April, 1887, and has frequently been revised and improved since that date. In fact the work of the Committee has been continuous, and it now sits as a sort of court to decide questions arising in practice under the Code, which are submitted to it by the officers of the members of the Association; and also to consider and propose such amendments as improved practice may have made advisable. The last revision was made in 1906 and the Code now contains 61 rules for the general operation of trains, with 23 additional for their operation under telegraphic orders, together with prescribed forms in which all such orders must be transmitted. These forms of train orders, it may be said here, are as well adapted for transmission by telephone as by telegraph and are being so transmitted to-day on a number of roads. The original code was for single track roads only, but this has since been supplemented by rules for the operation of roads with double tracks and with three, four or more tracks.

It was necessary to use a number of technical terms in the Standard Code, and railway operating terms were formerly rather indefinite. For instance, an extra train was called on many roads a "wild train," and on some roads a "wild-cat train." This term, after the fashion of railway men, was soon shortened; and it was simply called a "wild cat." From this noun was formed the verb "to wild cat." I remember seeing printed on the time-table of the Delaware, Lackawanna & Western Railroad, in the early eighties, a foot note to this effect, "Train No. —, on arrival at Summit will wild-cat to Morristown."

This expression, however, was not very widely used. A story is told that when the West Shore Railway was about to be opened the superintendent was examining men who had applied for positions as conductors. One man who had had experience in that position was asked, "What would you do if you should meet a wild cat on a side track?" He looked curiously at his questioner for a moment and then replied, "Well, if I hadn't a gun with me, I'd climb a tree." He had never heard the expression before.

There are also a number of arbitrary terms now used in the service, as, for instance, the words "empty" or "light" as applied to engines. An engine may be fully loaded with fuel and yet may be technically called "empty." So also a light engine may be much heavier than one that is not called light. The terms are synonymous and mean an engine not attached to a train. On French railways the term used to express the same idea is "une machine, haut le pied." The term "haut le pied" meaning "high the foot" is equally arbitrary, and is derived from its original application to a burden bearer, who,

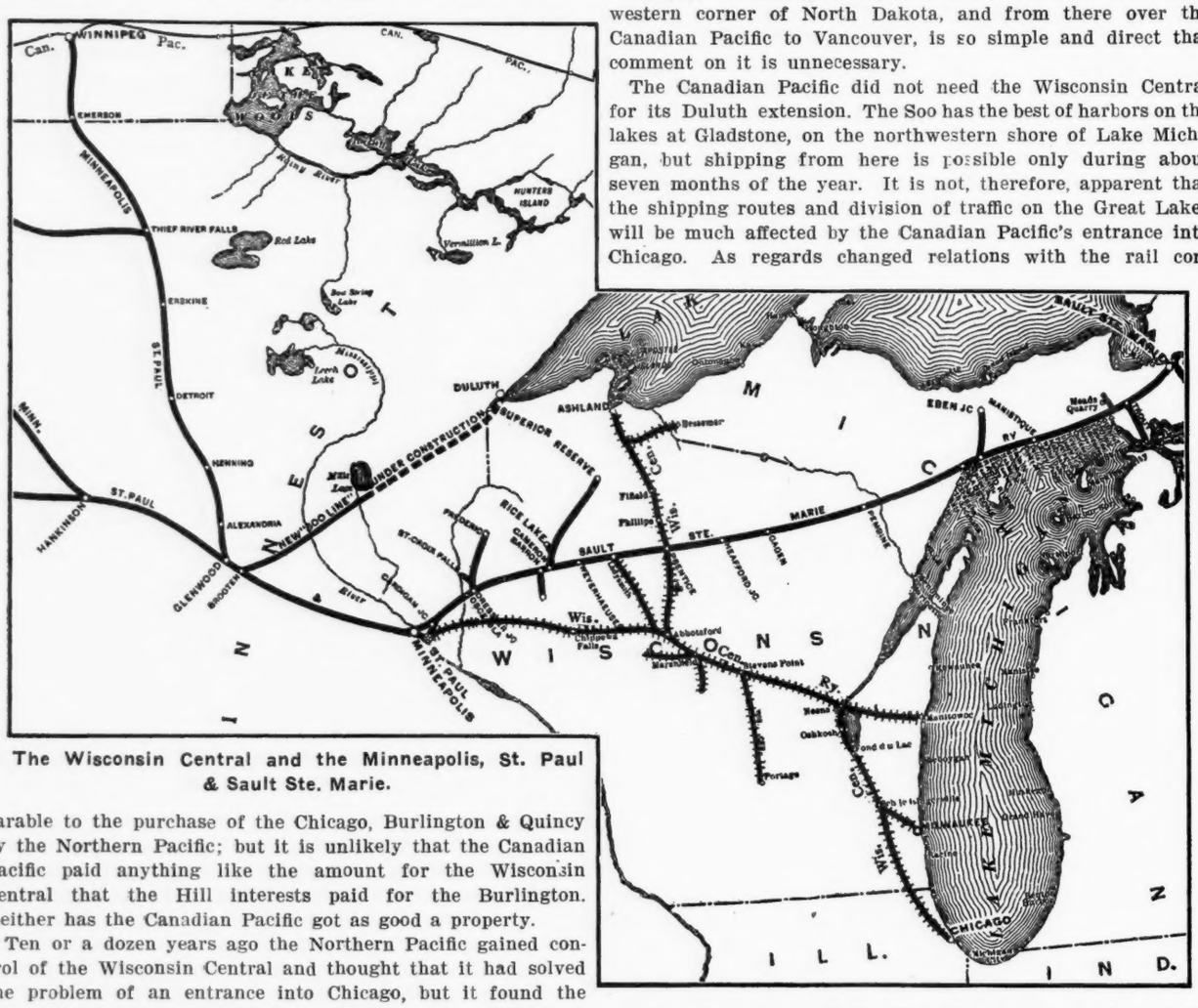
when walking without a load, is supposed to lift his foot high.

In connection with the publication of the Standard Code, it was, therefore, found necessary to prepare and embody in it a number of definitions of terms, which are presented immediately preceding the rules. The work of this Committee on Train Rules has been and still is of great value. Its history in detail is long and interesting, but it is not possible to devote more time to its consideration this evening.

(To be continued.)

THE CANADIAN PACIFIC'S ENTRANCE INTO CHICAGO.

The Minneapolis, St. Paul & Sault Ste. Marie, shown on the accompanying map, has gained control of the Wisconsin Central. This means, since the Soo is controlled by the Canadian Pacific, that the Canadian Pacific has gained an entrance over its own rails into Chicago. It is a move comparable to the purchase of the Chicago, Burlington & Quincy by the Northern Pacific; but it is unlikely that the Canadian Pacific paid anything like the amount for the Wisconsin Central that the Hill interests paid for the Burlington. Neither has the Canadian Pacific got as good a property.



The Wisconsin Central and the Minneapolis, St. Paul & Sault Ste. Marie.

Ten or a dozen years ago the Northern Pacific gained control of the Wisconsin Central and thought that it had solved the problem of an entrance into Chicago, but it found the Wisconsin Central unprofitable. That was the Wisconsin Central of a dozen years ago. Since then the road has been rebuilt. Moreover, the competitive conditions are quite different. The St. Paul had not at that time an extension to the Pacific coast. The North Western, the Burlington and other roads competing with the Wisconsin Central between St. Paul and Chicago when the Northern Pacific gained control of it, promptly made an alliance with the Union Pacific and shipped traffic that they had previously been sending over their own lines to St. Paul and then via the Northern Pacific to the coast, to Omaha over their own lines and then via the Union Pacific to the coast. To a certain extent they can make this same answer to the move of the Canadian Pacific, but it is obvious that the purchase of the Burlington by the Hill interests gave them their own line to Denver and was not open therefore to the same objection.

The Soo, itself, originates a great deal of traffic and twenty per cent., roughly, of its tonnage is grain, but ending at St. Paul, it could not deal directly with eastern trunk lines in the bargaining for a return haul.

The Wisconsin Central originates traffic especially in the region around Fond Du Lac, where large paper manufacturing plants are located, but this traffic shipped to Chicago gives a comparatively short haul. Now the Wisconsin Central freight agent can solicit traffic bound from Chicago to the coast, as can also the Soo and the Canadian Pacific freight agent. The advantages of shipping oriental bound freight from Vancouver rather than any port in the United States are many. The route via the Wisconsin Central to St. Paul, the Soo to Winnipeg, or more probably to Portal, almost in the northwestern corner of North Dakota, and from there over the Canadian Pacific to Vancouver, is so simple and direct that comment on it is unnecessary.

The Canadian Pacific did not need the Wisconsin Central for its Duluth extension. The Soo has the best of harbors on the lakes at Gladstone, on the northwestern shore of Lake Michigan, but shipping from here is possible only during about seven months of the year. It is not, therefore, apparent that the shipping routes and division of traffic on the Great Lakes will be much affected by the Canadian Pacific's entrance into Chicago. As regards changed relations with the rail connections it seems probable that the coast extension of the Chicago, Milwaukee & St. Paul will have a more direct effect than the purchase of the Wisconsin Central, and that each of these transactions will emphasize the other. The St. Paul extension made a competitor out of a traffic friend; the purchase of the Wisconsin Central makes the competition complete instead of partial.

In some ways the deal will be an advantage to the Hill lines. The Wisconsin Central has been more or less of a disturbing element in its territory. Any road that is not making much money and has to meet the competition of stronger lines is apt to cause more or less trouble by making in-

dependent reductions of rates and otherwise refusing to conform to the wishes of the stronger lines, the object, of course, being to get business that could not be obtained by perfectly legitimate methods and to force concessions from competing roads. The Wisconsin Central having passed to the control of a stronger property like the Canadian Pacific, its career as an independent trouble-maker is ended. The Soo has been a stronger road and part of a big system, but its location has made it heretofore a source of as much trouble to competing lines as the Wisconsin Central. As it does not reach Chicago, it has always been its interest, in order to get the long haul, to so adjust its rates so as to move traffic via other gateways. For example, it is to the interest of the Burlington to move traffic from the West to the Atlantic seaboard via St. Paul and Chicago, because that way it gets the long haul. It is just as much to the advantage of the Soo to move it via St. Paul and Sault Ste. Marie; in other words, to move it around north of the Great Lakes rather than south, because in that way it got the long haul. Now that the Canadian Pacific System reaches Chicago via the Wisconsin Central, it will not have exactly the same motive for moving traffic around north of the Great Lakes as it has had before, and the Burlington and other Chicago-St. Paul lines should find it easier to reach agreements with it regarding rates on traffic both eastbound to and westbound from the Atlantic seaboard. In these ways it is believed that the acquisition of the Wisconsin Central by the Canadian Pacific will be of benefit to competing roads.

In handling traffic east or west via Chicago, the Canadian Pacific has heretofore delivered traffic to the North Western, the St. Paul and the Burlington as well as to the Wisconsin Central, and in return has received traffic from these roads. Naturally, in the future the Canadian Pacific, in order to strengthen the Wisconsin Central, will deliver all or practically all of its traffic to Chicago to the Wisconsin Central, and of course will receive all in return that the Wisconsin Central has to give.

The Hill roads will be exposed to much more severe competition than heretofore through this consolidation, and when the St. Paul's extension is completed and the St. Paul is able to move traffic direct over its own lines from Chicago to the coast, the Hill lines, with the St. Paul's through line on one side of them and the Canadian Pacific with a through line on the other side of them, will have a good deal harder battle to hold and develop their through traffic than they have had in the past. Hitherto they have had something like a monopoly of business moving from Chicago via the northern route. They at least have had complete control of the situation. Now they will at once have one competitor all the way as strong as they are, and when the St. Paul is finished they will have two competitors all the way as strong as they are.

With reference to through traffic to and from the Orient, the Canadian Pacific already has through rates in connection with the North Western, the St. Paul and other roads. But of course now that it will own its own line from Chicago to the coast and its own steamships from the coast to Asia, it will be in a much better position to control this traffic than it has been while handling it in connection with other lines. This arrangement gives the Canadian Pacific a much better chance to fight for traffic between points in foreign countries and points in the United States and between points in the United States. For example, it gives it an all-rail line in connection with the New Haven from New England points to Chicago for the handling of all-rail traffic.

As regards the destination of Wisconsin Central local traffic, it is not so much further from Fond du Lac over the Wisconsin Central to its connection with the Soo, and over the Soo round the northern end of Lake Michigan, and by way of the Canadian Pacific to the Atlantic coast, than it is from Fond du Lac to Chicago, circling the southern end of Lake Michigan, and thence to the coast over foreign lines. In the one case of shipment by way of Chicago the system lines get only the comparatively few miles haul to Chicago over the Wisconsin Central, in the other case the system lines get the haul from Fond du Lac all the way to the Atlantic seaboard.

What the Canadian Pacific paid for the Wisconsin Central, or rather what the Soo paid for it, is impossible even to guess at. It was bought from nobody knows who, probably not at an exorbitant price. It is well known that the Canadian Pacific has been flirting with the Chicago Great Western. It evidently found the Wisconsin Central more to its taste, and possibly cheaper.

The acquisition of the Wisconsin Central is practically an accomplished fact, but there are further possibilities in the future. The Wisconsin Central has a fine terminal port at Manitowoc, and it is about 60 miles directly across Lake Michigan to Ludington, where the Pere Marquette has a fine terminal port, and these ports are open, if not all the year, certainly nearly all of it. The Pere Marquette stretches across Michigan to Detroit and from there to Buffalo, where it connects with the Canadian Pacific's good friend, the New York Central.

In the past the freight agent of the Canadian Pacific at New York, to get a long haul over its own rails, had to route the freight through Montreal to Vancouver, giving such lines as the Northern Pacific and the St. Paul an advantage, since they routed more directly through Chicago; but if the Canadian Pacific can pick up the freight from the New York Central at Buffalo, ship it to Detroit, across Michigan, ferry it over the lake, and from there ship almost directly to Vancouver, the disadvantages of a roundabout route have been eliminated. The routing of freight from Detroit to Ludington and across the lake to Manitowoc eliminates the use of tremendously expensive terminals at Chicago, and the consequent delay to freight in that city, while the terminals at Ludington and at Manitowoc are first class, but are not congested and are not expensive.

The map at least suggests that the acquisition of the Pere Marquette would be a logical next step for the Canadian Pacific in its steadily progressing advance into the United States. Its interesting relations with the New Haven, bearing many possibilities for the future, were somewhat fully described in the *Railroad Age Gazette* last week, page 98.

SHOP NOTES AT TOPEKA.

H. W. Jacobs, Assistant Superintendent of Motive Power of the Santa Fe, has designed a new smokebox superheater which is of the two-stage type and consists of cylindric drums fitted with smoke tubes. One of these is close to the front tube sheet and the other next to the smokebox front, the space between being left for the exhaust nozzle, and there is an annular opening left in the front drum large enough for a man to get in this space.

The steam from the boiler is taken first to the front drum and from there to the back drum where it is more highly heated and passes from there to the cylinder. The superheater has been in operation on one of the large freight engines, and its performance is now being measured up carefully by the testing department. An interesting thing about these drums is the fact that the tubes were welded in by the oxy-acetylene process. The railway company has a small plant fitted up in an outside building where the gases necessary for the process are generated, and they are able to weld and cut metal in this way quite successfully. The plant was designed by the testing department and is largely a home product.

At the new freight car shops at Topeka there is an open shed with special arrangements for repairing steel freight cars, especially those which have been badly damaged in wrecks. This shed is fitted with a large iron base plate with stanchions upon which the steel frames are placed and held

rigidly by chains and braces. The bent portions are then heated by an oil burner and gradually brought into position and straightened without being taken apart. It is surprising how skilful a good boilermaker can become in this kind of work and what a small expense is required to restore a steel underframe which is badly twisted by wreck or fire. Some bad cases of this kind have been completely straightened out at a cost of only $30 per frame.

At the planing mill they have a good labor-saving device used in connection with lumber delivered from the dry kiln, especially siding, sheeting and roofing for box cars. Instead of handling each board and piling it up from the dry kiln cars, the whole carload is transferred by air jacks to another car which remains in the planing mill and is run alongside the machine which is to finish the lumber. In this way only one handling of the lumber is required instead of two in the ordinary way.

Locomotive boiler checks for the Santa Fe are made with a cast steel case or body and they are fitted with brass side and top plug. This has been found necessary in order to prevent the abuse and destruction of the softer brass checks as ordinarily used, and the life of the steel checks is very much longer.

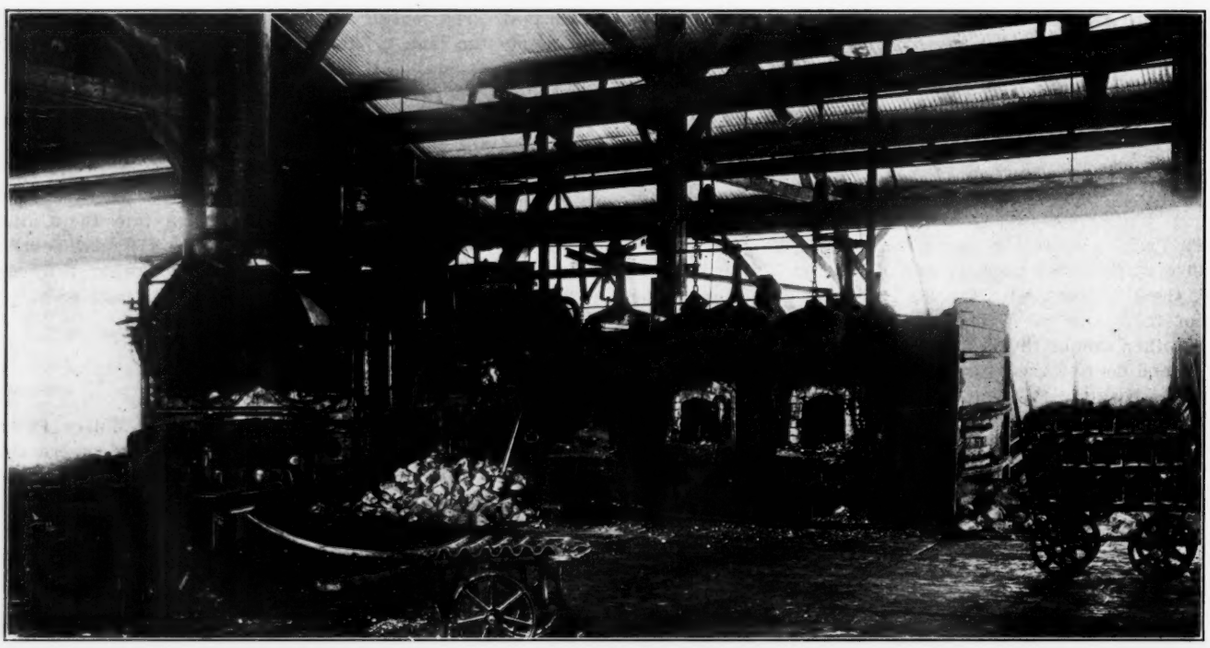
The work of the betterment department has completely standardized the various small tools used at the different shops of the Santa Fe and these are now all made at Topeka in a tool room which is regularly operated as a manufacturing shop; and lathe tools, reamers and other small tools are supplied to the storehouse for distribution to other shops. A large saving in expense for small tools has been effected in this way. This process of standardizing has also been extended to the small bolts for locomotives so that they are able to employ four automatic machines, made by the National Acme Company, Cleveland, Ohio. These four machines are attended by one man and may turn out large quantities of bolts, studs, set screws, brakeshoe bolts and other similar parts at a much smaller cost that when made by the ordinary machines. Automatic machines are seldom used by railways, but it is possible to use them to advantage on a large road where these small details are standardized and the work concentrated at one shop.

Among the interesting tools found here is a high speed drill 1¼ in. in diameter, which is driven at a speed of 450 r.p.m. and a small drill with clamps operated by air pressure. A small brass lathe is also fitted with an air cylinder for closing the chuck.

According to statistics relating to the use of material, which are kept by Mr. Rice, the storekeeper, an interesting fact that we have not before seen stated is, that 70 per cent. of the brass used by a railway should be paid for by scrap returned, and for ordinary iron castings 75 per cent. of the new work should be paid for by scrap returned. In the case of wrought iron this percentage is 60 to 65 per cent. In addition to all material used by the railway, Mr. Rice has charge of the fuel, and he has been able to develop a series of reports which show the daily consumption of fuel by each locomotive, and such reports are delivered at his office very promptly so that a profitable survey of fuel consumption by locomotives can be made and remedies applied for excessive consumption at the very time it exists and before it is forgotten, as is usually the case with delayed fuel reports.

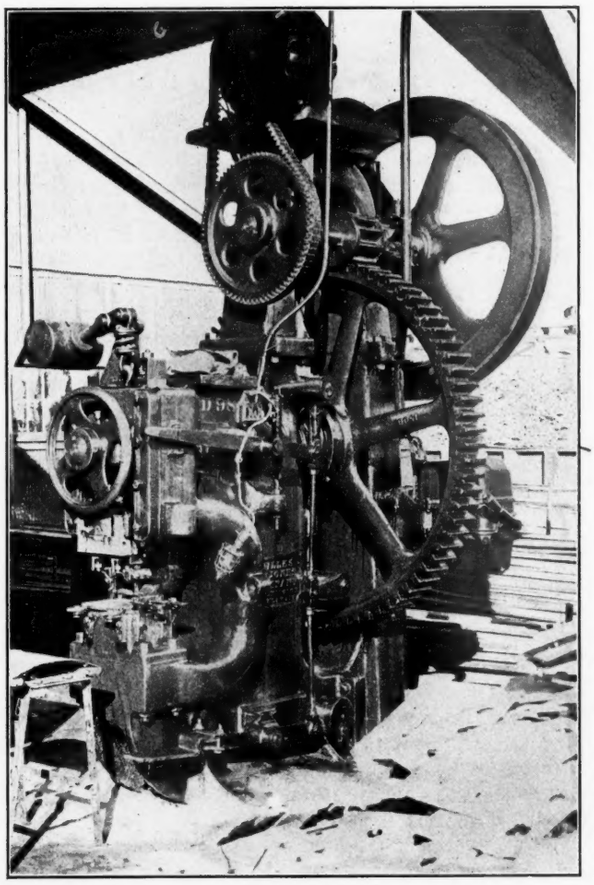
SOUTHERN PACIFIC ROLLING MILLS AT SACRAMENTO, CAL.

In 1876 the first set of rolls were completed and set up in the rolling mills of the Southern Pacific at Sacramento, Cal. These consisted of a single set of 13-in. rolls, three high, driven by a 12-in. x 18-in. vertical engine, which latter was built at the Sacramento shops of the company. The idea in making this installation was to demonstrate what was considered a possibility, the manufacture of bar iron from scrap at less cost than the market rates. The experimental mill proved a financial success from the outset, and it was decided to build a large size train of rolls equipped with suitable furnaces. The large rolls were made 18 in. in diameter, in three tiers, three high, driven by a 32-in. x 36-in. vertical engine. With these rolls it was possible to make all kinds of merchant bar iron, also iron for making track bolts, nuts, spikes, plain and angle connecting plates, tie plates, angle and channel irons and I-beams. In 1901 it was found necessary to build another mill about the same size and capacity as the one then in use. The rolls of this mill, with the engine driving them and the furnaces and boilers, were all built in the Sacramento shops.



Three-Door Oil Reverberatory Furnace.

Size: 5 *ft.* x 12 *ft.* 6 *in.* x 3 *ft.* 1 *in.* *Average charge of scrap per heat,* 4,800 *lbs.*



Tie Plate Punch.

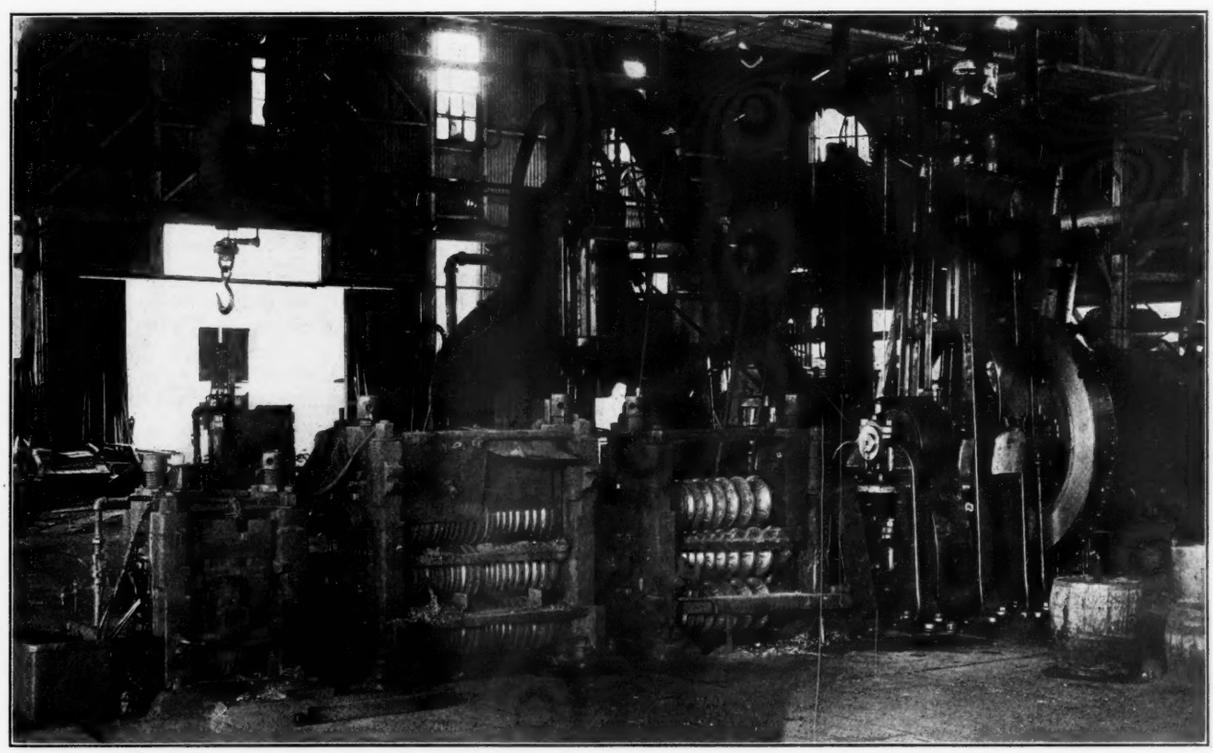
The heating furnaces in these mills, as well as those for use in connection with the steam hammers in the blacksmith shop, are fitted up for using crude oil fuel. The oil is used in furnaces of the return flame reverberatory type, the air being supplied by a Sturdevant blower at about 8 ounces pressure. This method, in conjunction with a special patented low-pressure burner, completely atomizes the oil and produces excellent results in heating. The use of crude oil for fuel has effected a substantial reduction in the cost of the product. The 20-ton hydraulic crane, the hoist for the charging rollers, the shears, punches and hot saw were all made in the Sacramento shops.

The average yearly output of the mill is 17,000 tons, mostly wrought iron. Some mild steel bars have been rolled from scrap, axles and billets. So far no attempt has been made to handle scrap steel. This feature of the work is now being considered and the manufacture of steel bars, as well as steel castings, will be undertaken in the near future. These mills were designed by H. J. Small, General Superintendent of Motive Power, of the Pacific System of the Southern Pacific Company, to whom we are indebted for the information and illustrations given herewith.

ELECTRIC HEADLIGHTS.

At the last quarterly meeting of the Southern and Southwestern Railway Club, held at Atlanta, Ga., November 19, the principal discussion was on "Headlights and Signals." J. W. Johnson, of the Pyle-National Electric Headlight Company, with a stereopticon, described and explained the Pyle-National Light and its generator, going into the subject in great detail.

The first experiments in the use of electricity for locomotive headlights were made by Leonidas Woolley about 1883, at Dayton, Ohio; but he does not seem to have carried his experiments to a successful conclusion. Charles J. Jenney, in 1885, put an electric headlight on an engine of the Cleveland, Cincinnati, Chicago & St. Louis, but this did not succeed. In



No. 1 Rolling Mill; Southern Pacific Shops at Sacramento, Cal.

Built in 1876. *Additional set of rolls added in* 1879.

1887 Mr. Woolley reappeared as the patentee of a few lights which were used on the Cleveland, Akron & Columbus. In 1888 the National Electric Headlight Company was organized by R. B. F. Pierce, George B. Pyle and others. This company produced the first electric headlight that made a complete successful trip, but on the death of Mr. Pierce, in 1898, the company went out of business. E. A. Edwards, of Cincinnati, invented an electric arc lamp and his company was in the field from 1889 until February, 1907. In 1897 Mr. Pyle, having designed a turbine engine and a better lamp, sold his patents to R. C. Vilas, who organized the Pyle-National Company. Continuing, Mr. Johnson said:

Until 1898, less than 175 electric headlights had been manufactured in this country. After the organization of the Pyle-National the electric headlight was soon developed to such a state of perfection that in the year following, 472 electric headlights were manufactured and sold by this company. A large portion of these were published by roads in your Southern States. The track, at that time, was not in the good condition it is found to be in at this time, and wrecks were of an almost every night occurrence, coupled with the loss of life and destruction of property. This was partly due to cattle lying down on the track at night. With the old headlight, it was not possible for the engineer to observe the animals until almost upon them. As soon as the electric headlight was applied to a locomotive, it was noted immediately that this particular engine did not strike any more stock after night. I was in Shreveport, La., at the time the Kansas City Southern equipped its first passenger locomotive with an electric headlight, and on this first trip the electric headlight pointed out to the engineer five big mules that had run on to a bridge and were down. The engineer stopped his train and with the aid of the train crew and passengers, got the mules out with little delay to train and no injury to the animals. The Pyle-National Company now has ever 10,000 equipments in service on 295 railroads in this and foreign countries. There are no railroads that ever try this device that do not extend the number very fast. There is one large railroad in this country that is using over 900 and several that are using 500 and more.

Mr. Johnson read letters from railroad officers in different parts of the country testifying to their satisfaction with electric headlights. On roads where many animals had been killed by trains at night a marked saving resulted in the use of the electric lights. In a period of seven months on the Oregon Railroad & Navigation Company's line the average cost of maintenance of electric headlights was $1.30 each. Officers of the company believe it to be cheaper than either acetylene, gas or oil. On the Rock Island road the cost of operating electric headlights was calculated at 85 cents each per month.

Following Mr. Johnson's address, E. T. Sawyer briefly described the acetylene headlight. He said that the maintenance of headlights for one year would cost about as follows: Electric, $230; oil, $40; acetylene, $30. Acetylene has been used with marked success for the lamps in fixed signals. At a signal bridge carrying eight semaphore lights a tank containing 2,200 cu. ft. kept all of the lights burning night and day for over five months with no attention. Each light had a ⅛-ft. burner.

The state of Georgia now has a law making the use of electric headlights cumpulsory, and in the discussion of the subject it came out that the statute specifies the size of the reflector as 23 in. in diameter.

Georgia is the only state that has specified a diameter of 23 in. Texas, Oklahoma and Arkansas have laws which require the reflector to be not less than 18 in. in diameter.

Mr. Johnson said that a 23-in. reflector was unnecessary; one 18 in. in diameter is entirely satisfactory. With a clean reflector, this diameter will light up the road 20 to 25 telegraph poles ahead, and will furnish 135,000 candle-power. A larger reflector will light up a wider path, but will not throw light any farther ahead. Replying to criticisms concerning the large amount of steam required to energize the Pyle-National light, Mr. Johnson said that no engine or motor using less steam would give satisfactory service.

REMARKABLE REDUCTION IN BOILER FAILURES ON THE "SOO" LINE.

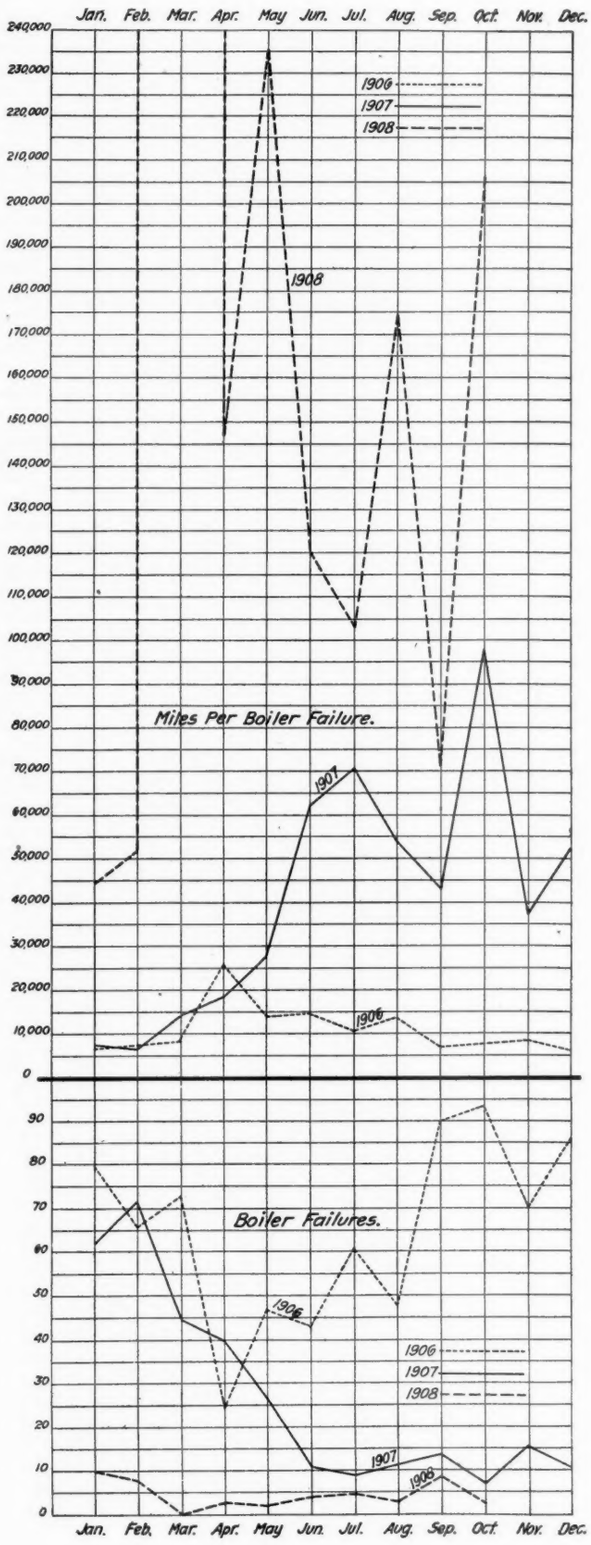
The accompanying chart shows graphically the record of boiler failures on the Minneapolis, St. Paul & Sault Ste. Marie Railway for the last three years—or to be exact, for 1906 and 1907 and for ten months of 1908. The chart is in two parts, one of which shows the total number of boiler failures for each month of the year, and the other the number of miles made per failure per month. It will be noticed that each chart falls into two parts, the division being at June, 1907, when there was a marked reduction in failures as compared with preceding months that has continued ever since. The low point was reached in March of the present year, when no failures occurred. This, of course, throws the peak of the "miles per boiler failure" for that month at infinity. It should be mentioned that these results were attained in spite of a boilermakers' strike which occurred last fall and the filling of the places of the striking union boilermakers with non-union men, who on the average were less skilful and experienced than the men they supplanted.

We are informed by Mechanical Superintendent T. A. Foque that these results are due entirely to the use of a boiler compound which was begun experimentally in the spring of 1907. It was unknown in railway service prior to that time, and the trial on the "Soo" Line was authorized with rather more than the usual amount of skepticism. A heavy decapod locomotive which was running in the worst of the bad-water districts and giving more trouble than any other engine on the road was assigned for the trial. The results were immediate and pronounced. Whereas this locomotive under the old conditions was costing several hundred dollars a year for boiler work, the expenditure for this purpose at the end of a year with the compound was just 26 cents, and the boiler was clean and in excellent condition.

The use of the compound was soon extended to all engines in bad-water districts with equally gratifying results in all cases. Fast passenger engines which had been sent to the shop for new fireboxes shortly after the use of the compound was begun were treated with it instead of being repaired and gave no further trouble, the fireboxes being still in service. In the bad-water districts the firebox mileage for passenger engines formerly averaged from 35,000 to 60,000 miles, and there was constant trouble on the road from the boilers, causing frequent delays to trains. Recently, on the hardest run, an engine had a credit of 125,000 miles, or about three times what it made under the old conditions. A number of new engines bought last year have made 80,000 miles, where ordinarily they would have made half this mileage, and from present indications a mileage of 100,000 to 125,000 is expected from the fireboxes. In freight service, on one division the heavy engines had a boiler failure for every 900 miles in September, 1906. In September, 1907, there was a mileage of 20,000 per boiler failure, and this year the same class of engines made 40,000 miles in September without a boiler failure. September, by the way, was the heaviest month in the history of the road; yet not only was the business handled promptly, but there was surplus motive power, repaired and ready for service, which was not needed. As might be expected, the roundhouse boiler work per engine has been considerably reduced and the back-shop work has benefited likewise.

There was at the start the usual prejudice on the part of employees against a boiler compound, and considerable work was required to get it properly used, but as soon as they realized fully what it was doing objections ceased and they

co-operated willingly to get the best results. Enginemen are as careful now to see whether the engine has its supply of compound before going out as they are to note whether it has water. The use of the compound has long passed the experimental stage, the permanency of the results on the "Soo" Line being well shown by the chart.



Record of Boiler Failures for Three Years on the Soo Line.

THE VALUATION OF RAILWAYS.

The valuation of railways, although in a relative sense neglected, has not been least conspicuous among the questions which have engaged the attention of the thoughtful contingent of the public in the recent past. Its inherent importance and its intimate relation to other things amply justify both the measure of interest attracted and the degree of caution which its contemplation inspires. The subject is so complex in its nature, the factors entering into it are so intricate,, and in its consideration so many points arise concerning which honest and intelligent opinion may reasonably differ, that any precise conclusions reached pending searching inquiry and mature deliberation might be premature and essentially erroneous. But, for reasons which will appear hereafter, the problem promises to press for solution until its claims to recognition shall have been met by definite and appropriate action. The present effort is directed to the consideration of some of the varying phases which the topic assumes, the benefits which may reasonably be expected to result from valuation, and some of the difficulties which must be encountered and overcome before the matter can be finally disposed of; to the suggestion and discussion of questions rather than an attempt finally to answer them.

The Republican National Convention, held at Chicago in June, failed to commit itself to the valuation of railroads. The Democratic National Convention, held in Denver in July, did so commit itself. It would be hasty to assume that the Republican party does not favor a valuation, or to criticise its failure in this respect. Giving both parties credit for entire good faith and sincerity of purpose, the action of their respective conventions is apt to approve itself to the thoughtful judgment of a conservative advocate of valuation. Had the Republicans pledged themselves in the premises, they might have found it necessary in order to redeem the pledge to hurry legislation through the next session of Congress. On the other hand, conceding to the Democrats their claim to success in the approaching national campaign, if not their expectation of it,* some years must elapse before any partisan legislation could be enacted. The subject is of too great and far-reaching importance to every interest in the country, and fraught with too many dangers, to admit of specific legislation respecting it except after the most thorough investigation of all its details, and the most mature deliberation. The problem as it presents itself will call for the best skill and the highest integrity that can be brought to bear upon it, and as the work progresses new difficulties will naturally arise. It is not certain that the co-operation of the states must not be enlisted in order to render the result complete and effective. These things will require time.

Mr. Taft, the Republican candidate for the presidency, referred in part to the subject of railroad valuation in his speech of acceptance delivered at Cincinnati on July 29 in this language:

"I have discussed this, with some degree of detail, merely to point out that the valuation by the Interstate Commerce Commission of the tangible property of a railroad is proper and may from time to time be necessary in settling certain issues which may come before them, and that no evil or injustice can come from valuation in such cases, if it be understood that the result is to be used for a just purpose and the right to a fair profit under all the circumstances of the investment is recognized. The Interstate Commerce Commission has now power to ascertain the value of the physical railroad property, if necessary, in determining the reasonableness of rates. If the machinery for doing so is not adequate, as is probable, it should be made so.

"The Republican platform recommends legislation forbidding the issue in the future of interstate railway stocks and bonds

*This paper was written before the national election.—EDITOR.

without Federal authority. It may occur in such cases that the full value of the railway, and, as an element thereof, the value of the tangible property of the railway, would be a relevant and important factor in assisting the proper authority to determine whether the stocks and bonds to be issued were to have proper security behind them, and in such case, therefore, there should be the right and the machinery to make a valuation of the physical property."

Moreover, since the passage of the Act of June 29, 1906, the administration through its appointed agencies has been prosecuting a systematic line of work which may very naturally find its consummation in a physical valuation. At all events, the integrity of the capital accounts of railroads and the line of demarcation between operating expense and capital investment is receiving special attention at the hands of the Interstate Commerce Commission. Finally, it is no doubt true that the effectual regulation of the railroads, apart from abuses and violations of law, can be effected with least injury to the railroads themselves and the interests of the people generally through the formulation of a well-considered and comprehensive plan and the inauguration of it by a gradual and logical progression.

What is the reason, and what the supposed necessity for a valuation of the railways? Answer, the promotion of the ends of justice; not justice to the railroads, not to investors, nor yet to the shipping and traveling community; but mere abstract justice, let it affect whom it will. The country has just passed through a cycle of commercial and industrial activity and of material growth such as hitherto has been unknown in our national history. Facilities for transportation, taxed to the utmost, were inadequate. At the crest of the wave and at a time when the wheels of industry were in motion for 24 hours a day; when the tradesman's profits were scarcely limited except by his capacity for transacting business; when labor was better employed and better paid than ever before; when the average of commodity prices was higher by 42 per cent. than in the previous decade; and when the monetary standard was depreciated and depreciating—there sprang up from a score of states in various parts of the country an insistent demand for cheaper transportation, improved transportation service, or both. Revenues of the railroads were curtailed in one State after another, by legislative enactment or the action of local regulating bodies. The expense of operation, already out of proportion with revenues and with the records of previous years, was further augmented by the same authority. From what treasury of resource the resulting burden was to be borne, few asked and none volunteered to make answer. Levies for taxation have been increased, and net revenues minimized. The treasuries of the railroad companies are depleted, and their credit is impaired at home and abroad; for confidence is the basis of credit, and confidence depends upon ability to pay.

With traffic in plenty, it was difficult to earn a profit; with a plethora of it, poverty increased. After the crisis in the recent depression the struggle of some of the lines ceased to be for gain and became one for continued existence. Whether or not this extreme was reached, the effect on all the railroads, with a possible few unimportant exceptions, was alike. Within a year twelve companies, with an aggregate mileage of 7,242 miles and securities amounting to $582,903,904, passed into receivership. The announcements of insolvency suggested the early 90's; however different the responsible causes, the effect was the same.

To state these things is to prove maladjustment and to establish the urgent need of a remedy. This may take the form (1) of increased revenues, (2) of diminished expense of operation, or (3) of increased operating efficiency.

As payrolls amount to more than one-half of the total of operating expenses, it is difficult to see how any great reduction can be made in this respect without affecting the salaries of employees and entailing a long train of immediately adverse consequences. Until recently this course was not possible; when the demand for labor is restored it will again be impossible.

It is not improbable that more or less substantial economies could be effected in the dispensing and use of supplies, and elsewhere in operation. There is little doubt that there has been waste; it would be nothing less than miraculous if there had not been, ranging from the necessary through the careless to the criminal; and it is equally certain not only that there still is, but that there will continue to be. Kept within reasonable bounds, waste is a necessary part of the legitimate operating expense of such an enterprise. But it is unlikely in the extreme that the aggregate of the possible economies in this direction would afford more than partial relief.

Some means to economy or to added efficiency, not now thought of, may develop. The introduction of an essentially non-frictional bearing, whose merits have been subjected to the tests of actual use and which it is claimed is now ready for manufacture commercially, may hold great possibilities and go far towards relieving the tension. If a locomotive with a capacity of thirty cars can be made to haul forty-five cars, with the same fixed train expenses and with little increase in fluctuating expenses, the effect on the expense of operation and on net revenues would be summary.

Failing in one of these directions, disaster must follow. The carriers will suffer first, but they will not long suffer alone; for the activities of the country are so bound up in one common cause, that, but injure one and the injury reacts upon all the rest, it may be with accumulated force.

Analytical examination of the constitutions and laws creating and empowering the several state railroad commissions discloses the fact that the commissions of thirty-four states are authorized either to establish or regulate rates. The remaining six commissions are advisory in their nature.

The powers of thirty-seven state commissions to supervise and regulate transportation service extend to necessary control over operating expenses or capital expenditures, or both.

The laws of nine states direct that a valuation of railroad property shall be made. This is unquestionably a step in the right direction; but there is no reason to infer that the amount of invested capital has received general acceptance as a basis for governmental rate making or rate regulation; nor, having in mind the limited progress made in this direction and the separation of the interstate and intrastate uses of such invested capital, does it appear that this basis could have been so accepted.

Enactments of some of the states provide for a court review, and this right is held to exist whether specifically provided for or not; but, apart from the conservatism of the courts, and their readiness to protect property rights, this does not affect the situation materially. In the present state of affairs the courts are necessarily under the same disability in the ascertainment of the reciprocal rights and obligations involved as are the legislatures and railroad commissions.

There is given below a brief and necessarily imperfect account of the regulative measures adopted within the past one or two years, either by legislative act or by order of state commissions which have the sanction and effect of law.

States which have ordered the adoption of 2-cent passenger fares for all or principal lines of road—Arkansas, Georgia, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Mississippi, Missouri, Nebraska, Ohio, Oklahoma, Pennsylvania, Virginia, West Virginia and Wisconsin.

States which have ordered the adoption of 2½-cent passenger fares for all or principal lines of road—Alabama, Montana, North Carolina, South Dakota and Tennessee.

States which have ordered material and more or less general reductions in freight rates—Alabama, Georgia, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Nevada, North Carolina, Oklahoma, South Dakota, Texas, Virginia and Wisconsin.

In one state alone it has been estimated that the reductions

ordered in freight rates will amount to $1,000,000 annually. At not a few points interstate rates are shown to be affected by the changes.

States which have ordered the limitation of working hours of employees—Connecticut, Indiana, Kansas, Maryland, Minnesota, Missouri, Montana, Nebraska, New York, North Carolina, South Carolina, South Dakota, Texas and West Virginia.

States which have ordered minimum train crews—Arkansas, Indiana, Kansas, South Dakota and Texas.

States which have enacted employers' liability laws—Iowa, Kansas, Michigan, Nebraska, Oklahoma, Pennsylvania, South Dakota and Wisconsin.

The characteristic of these laws is that an employer is made legally liable for injury sustained by an employee within the scope of his employment, through the non-feasance or misfeasance of a fellow-servant.

States which have ordered a reciprocal demurrage arrangement—Alabama, Colorado, Indiana, Kansas, Minnesota, Missouri, Oregon, South Dakota, Texas, Vermont and Washington.

In some instances penalties as high as five dollars per car per day are imposed.

In addition to numerous orders, it is probable that not fewer than 200 laws restricting revenues or regulating the operations of carriers have been enacted by the several states within the past two years. The duties enjoined and the things prohibited, by law or order, include the following:

Acts required—improvements to roadway and structures; the establishment of terminals; the establishment of stations at state lines and elsewhere; the fencing of tracks; the construction of private side-tracks; the installation of a block system of train movement; the acquisition of additional equipment; the use of caboose cars of a specified type; the installation of electric head lights; the introduction or extension of the use of safety appliances; the establishment of telephone pay stations in railroad stations; the running of passenger trains on time; the running of extra passenger trains when regular trains are one hour late or more; the transportation of freight traffic at a specified minimum speed; the carriage of passengers on freight trains; the seating of passengers before collection of fares; an extra seat for women passengers accompanied by an infant or young child. Acts prohibited—the confiscation of coal, under penalty of from 25 to 100 per cent. of its value; transfer to federal courts of actions brought in state courts, on pain of forfeiture of license, etc.

The penalties imposed are perhaps fairly illustrated by the excerpts which follow:

". . . Any common carrier, railroad corporation or street railroad corporation which shall violate any provision of this act, or which fails, omits or neglects to obey, observe or comply with any order or any direction or requirement of the commission, shall forfeit to the people of the state of New York not to exceed the sum of five thousand dollars for each and every offense; every violation of any such order or direction or requirement, or of this act, shall be a separate and distinct offense, and, in case of a continuing violation, every day's continuance thereof shall be and be deemed to be a separate and distinct offense." (Laws of New York, 1907, Chap. 429, Art. III., Sec. 56, Subsec. 1.)

"Any railroad of other corporation which violates any of the provisions of this chapter or refuses to conform to or obey any rule, order or regulation of the corporation commission shall, in addition to the other penalties prescribed in this chapter, forfeit and pay the sum of five hundred dollars for each offense, to be recovered in an action to be instituted in the superior court of Wake county, in the name of the state of North Carolina, on the relation of the corporation commission; and each day such company continues to violate any provision of this chapter or continues to refuse to obey or perform any rule, order or regulation prescribed by the corporation commission shall be a separate offense." (Reference: Laws (1905, revised) of the state of North Carolina, Chapter 20, Article VI., Section 1087.)

"If any railroad company, subject to this chapter, or its agent or officer, shall hereafter charge, collect, demand or receive from any person, company, firm or corporation a greater rate, charge or compensation than that fixed and established by the railroad commission for the transportation of freight, passengers or cars, or for the use of any car on the line of its railroad, or any line operated by it, or for receiving, forwarding, handling or storing any such freight or cars, or for any other service performed or to be performed by it, such railroad company and its said agent and officer shall be deemed guilty of extortion and shall forfeit and pay to the state of Texas a sum not less than $100 nor more than $5,000." (Reference: Revised Statutes of Texas, 1895, Article 4573.)

" . . . Any railroad corporation or transportation company which shall fail or refuse to conform to such rates as shall be established by such commissioners, or shall charge rates in excess thereof, . . . shall be fined not exceeding twenty thousand dollars for each offense; and any officer, agent, or employee of any such corporation or company, who shall demand or receive rates in excess thereof, or who shall in any manner violate the provisions of this section, shall be fined not exceeding five thousand dollars, or be imprisoned in the county jail not exceeding one year. In all controversies, civil or criminal, the rates of fares and freights established by said commission shall be deemed conclusively just and reasonable; and in any action against such corporation or company for damages sustained by charging excessive rates, the plaintiff, in addition to the actual damage, may, in the discretion of the judge or jury, recover examplary damages. . . . The legislature may, in addition to any penalties herein prescribed, enforce this article by forfeiture of charter or otherwise, and may confer such further powers on the commissioners as shall be necessary to enable them to perform the duties enjoined on them in this and the foregoing section." (Reference: Constitution of the state of California, Article XII., Section 22.)

In the spring of 1907 the legislature of New York passed a bill establishing 2 cents, with certain qualifications, as the legal rate of passenger fare. Without necessarily passing upon the merits of the case and referring to the power conferred upon the public service commissions (created at the same session) to deal with the subject, Governor Hughes vetoed the measure on June 11 of that year, remarking:

"The passage of the bill was not preceded by legislative investigation or suitable inquiry under the authority of the state. Nor is the fixing of this rate predicated on reports or statistics officially collated which would permit a fair conclusion as to the justice of its operation with reference to the railroads within its purview. It plainly reflects dissatisfaction with existing conditions and an effort to provide a remedy through arbitrary action.

"The bill represents a policy seriously mistaken and pregnant with disaster.

" . . . In dealing with these questions democracy must demonstrate its capacity to act upon deliberation and to deal justly.

"It is of the greatest importance not only that railroad corporations should be compelled to respect their public obligations, but also that they should be permitted to operate under conditions which will give a fair return for their service. Upon this depends not simply the security of investors, but the security of their employees and the protection of every form of industry and commerce through the maintenance and extension of necessary transportation facilities. Nothing could be more opposed to the interests of the community as a whole than to cripple transportation corporations by arbitrary reduction of earnings."

In the opinion by JJ. Audenried and Willson, sitting in the Court of Common Pleas at Philadelphia September 10, 1907,

declaring the Pennsylvania 2-cent fare law unconstitutional, the court said 'That there is no evidence that the legislature investigated the matter before enacting the law."

Of neither of these lines of regulation, affecting revenues and expenses respectively, is there cause for just criticism, so long as the action taken is done advisedly; so long as the rights of the people are not submerged in those of the carriers, and so long as the interests of the carriers are not made to wait upon unreasoning demands on the part of the public. Indeed, any act of regulation that is reasonably adapted to secure a performance of the proper functions of common carriers in a proper manner, without exceeding these limitations, is in the highest degree commendable. Persons should be transported with safety, comfort and expedition, and property with safety and despatch; at equitable fares and rates, and upon equal terms to all.

The reasonableness of a given rate depends upon its relation to other rates; the reasonableness of a system of rates is determined by its relation, together with the volume of traffic moving, to capital invested in the enterprise rendering the service. In no case of general reduction in rates or fares is there conclusive proof, or serious effort to adduce it, that the action taken was appropriate either in kind or degree. There is lack of convincing evidence that the subject matter in any case has been referred to any intelligent criterion, or even that there exists at the present time any test which can be relied upon to determine where the rights of the shipper and traveler end and those of the transportation agency begin; save, however, the vague indication afforded by the fact of payment or non-payment of interest or dividends on a nominal capitalization which may be either greater or less than actual invested capital, and which perhaps in no single instance is coextensive with it. The railroads may have been oppressing the people through the imposition of excessive rates for service, and that condition may still obtain; the people may have been oppressing the railroads by withholding from them an equitable return upon their bona fide investment and the equal protection of the laws, and that condition may still remin uncorrected. The probabilities in this respect will be alluded to in a subsequent paragraph.

It is a maxim in equity that there is no right without a remedy; but here are correlating rights and obligations without an adequate remedy for their enforcement, and without so much as a reliable means of ascertaining their extent or defining their limitations—rights involving billions of dollars of capital and more than a billion and a half of annual revenue; rights whose adequate enforcement lies at the foundation of business confidence, credit, commerce, and our material well being; and whose protection or invasion will determine the ultimate success or failure of American institutions.

A carrier is not necessarily entitled of right to earn dividends upon its stock issues, or even to earn interest on its funded obligations; nor is it so entitled in law. But it is entitled both of right and in law to realize a reasonable and just profit upon the capital appropriated to public use in the carriage of persons and property; and if the law governing the case is sound, the logic of it is equally so. Witness the following:

"It cannot be said that a corporation is entitled, as of right, without reference to the interests of the public, to realize a given per cent. upon its capital stock. When a question arises whether the legislature has exceeded its constitutional power in prescribing rates to be charged by a corporation controlling a public highway, stockholders are not the only persons whose rights or interests are to be considered. The rights of the public are not to be ignored. It is alleged here that the rates prescribed are unreasonable and unjust to the company and its stockholders. But that involves an inquiry as to what is reasonable and just for the public. . . . The public cannot properly be subjected to unreasonable rates in order simply that stockholders may earn dividends. The legislature has the authority, in every case, where its power has not been restrained by contract, to proceed upon the ground that the public may not rightfully be required to submit to unreasonable exactions for the use of a public highway established and maintained under legislative authority. If a corporation cannot maintain such a highway and earn dividends for stockholders, it is a misfortune for it and them which the constitution does not require to be remedied by imposing unjust burdens upon the public." (Reference: Covington & Lexington Turnpike Road Co. v. Sandford, 164 U. S., 578.)

"If a railroad corporation has bonded its property for an amount that exceeds its fair value, or if its capitalization is largely fictitious, it may not impose upon the public the burden of such increased rates as may be required for the purpose of realizing profits upon such excessive valuation or fictitious capitalization; and the apparent value of the property and franchises used by the corporation, as represented by its stocks, bonds and obligations, is not alone to be considered when determining the rates that may be reasonably charged." (Reference: Smyth v. Ames, 169 U. S., 466.)

"We hold, however, that the basis of all calculations as to the reasonableness of rates to be charged by a corporation maintaining a highway under legislative sanction must be the fair value of the property being used by it for the convenience of the public. And in order to ascertain that value, the original cost of construction, the amount expended in permanent improvements, (a) the amount and market value of its bonds and stock, the present as compared with the original cost of construction, (b) the probable earning capacity of the property under particular rates prescribed by statute, and the sum required to meet operating expenses, are all matters for consideration, and are to be given such weight as may be just and right in each case. We do not say that there may not be other matters to be regarded in estimating the value of the property. What the company is entitled to ask is a fair return upon the value of that which it employs for the public convenience. On the other hand, what the public is entitled to demand is that no more be exacted from it for the use of a public highway than the services rendered by it are reasonably worth." (Reference: Smyth v. Ames, 169 U. S., 466.)

Note.—The writer does not concur in the opinion that phrases (a) and (b) are pertinent to an inquiry as to value for the purpose of determining the reasonableness of rates, for reasons elsewhere expressed.

"From what has thus been said, it is not to be inferred that the power of limitation or regulation is itself without limit. This power to regulate is not a power to destroy, and limitation is not the equivalent of confiscation. Under pretence of regulating fares and freights, the state cannot require a railroad corporation to carry persons or property without reward; neither can it do that which in law amounts to a taking of private property for public use without just compensation, or without due process of law." (Reference: Stone, et al., *v.* Farmers' Loan & Trust Company, 116 U. S., 307.)

"The question of the reasonableness of a rate of charge for transportation by a railroad company, involving as it does the element of reasonableness both as regards the company and as regards the public, is eminently a question for judicial investigation requiring due process of law for its determination. If the company is deprived of the power of charging reasonable rates for the use of its property, and that deprivation takes place in the absence of an investigation by judicial machinery, it is deprived of the lawful use of its property, and thus in substance and effect, of the property itself, without due process of law and in violation of the Constitution of the United States; and in so far as it is thus deprived while other persons are permitted to receive reasonable profits upon their invested capital the company is deprived of the equal protection of the laws." (Chicago, etc., R. Co. *v.* Minnesota, 134 U. S., 418.)

(*To be continued.*)

General News Section.

Reports that the Michigan Central will use electric motive power except in the tunnel and terminals in and around Detroit are authoritatively denied.

According to the Portland (Oregon) *Express*, the "A B C" despatching rules, now in extensive use on the Northern Pacific, are to be introduced on a division of the Great Northern.

Jared Barker, of Larwill, Ind., a boy of 15 years, is to be taught telegraphy and given a position on the Pennsylvania lines as a reward for having given prompt notice of a log which he found on the track.

The first of a series of matinee smokers, with a vaudeville program, arranged by the Machinery Club, New York City, was held on Saturday afternoon, January 16, at 50 Church street. The attendance was very large.

The strike of the shop employees of the Denver & Rio Grande, which began in March, 1908, was ended on January 11, after a conference between officers of the road and representatives of the labor organizations. It is stated that the settlement was a compromise, both sides making concessions.

It is announced that suit is to be instituted in Texas, at the instance of the Railroad Commission, against the International & Great Northern, on the ground of insolvency, to forfeit its charter and to compel it to put its property in safe physical condition; also to cancel the receivers' certificates issued to secure proceeds to be used in paying interest on the funded debt. The suit to forfeit the road's charter will be brought in a Texas state court, while the proceeding to cancel the receivership certificates will probably be brought in the Federal court which appointed the receiver.

The Illinois Central will appeal from the decision of Judge St. Paul at New Orleans in favor of the St. Louis & San Francisco in its contention with the Illinois Central and Yazoo & Mississippi Valley for the carrying out of the contract permitting the trains of the Colorado Southern, New Orleans & Pacific road to be run over the Yazoo & Mississippi from Baton Rouge to New Orleans. In the meantime the refusal of the I. C. will prevent the Colorado Southern, New Orleans & Pacific from running its trains from Houston into New Orleans, although its line is completed and ready.

The Central Railroad of New Jersey has within the past week or two dropped from the maintenance of way department upwards of 100 track watchmen, whose duty it was to patrol the road nights between Jersey City and Scranton, 190 miles. An unexpected trip made over the road a few nights ago by officers, who had reason to suspect that all of these men were not attending to their duties, resulted in the discovery that the officers' suspicions were well founded. The trip was made on an engine whose headlight was kept dark. But four men were found on duty over the 30-mile run between Jersey City and Bound Brook. These four were retained and 100 discharged. The company employs a large force of watchmen on the Lehigh and Susquehanna division, between Easton and Scranton, where the road runs close to the Lehigh river and at the base of steep mountains, where floods and loose rocks are liable to obstruct the tracks. No track watchmen on the latter division have been charged with neglect of duty.

The Voices of the Governors.

Governor Fort, of New Jersey, in his first annual message to the legislature of that state recommends the passage of a public utilities law similar to that which is now in effect in New York. As heretofore reported in the *Railroad Age Gazette*, the railroad commission of New Jersey was divided on this question, two members being in favor of more stringent regulation of railways and a third member, the chairman, favoring the continuance of the present law in New Jersey.

Governor Marshall, of Indiana, in his inaugural address, recommends the repeal of the law under which the state railroad commission was organized, and the enactment of a new law providing for a new commission. The law (passed in 1905), and amendments passed in 1907, are inconsistent, vague and uncertain. The Governor would have on the commission an attorney, with railway knowledge and experience, and a man familiar with the mechanical part of railroading. He would make more stringent the law forbidding trespassing on railways.

In his annual message to the Iowa legislature Governor Garst recommended that the members of the State Railroad Commission be made appointive by the Governor instead of elective; that their salaries be increased to at least $3,500 a year; that they be required to devote their entire time to their work, and that their term of office be extended to six years. Governor Garst said that the prosecuting and administrative functions of the commission should be separated and recommended that to this end an attorney to represent the state before the commission be appointed with a salary of not less than $3,000 a year.

Governor Campbell, of Texas, in his message to the legislature says that local freight rates upon Texas traffic are higher than those applying upon the local traffic of almost any state in the Union. The effort of the railroad commission to give the people needed relief has been resisted by every means that could be devised by corporate cunning. Seventeen states have reduced passenger rates to 2 cents a mile, and not one of them has given the railways enough land in value equal to all the railways in such states; but this Texas has done. During the last legislature I recommended that the passenger rates be reduced to 2 cents a mile, but the measure failed mainly as a result of the promise of the railways to give the people better service and relief from burdens imposed by freight rates. In this the people have been grievously disappointed. Railways have increased the rates applying on interstate traffic having origin or destination in Texas an average of nearly 10 per cent. I, therefore, again earnestly urge upon the legislature the enactment of a law reducing passenger rates to 2 cents a mile.

Prizes on Oregon Short Line and Southern Pacific

General Superintendent J. M. Davis, of the Oregon Short Line, reports the following prizes as having been awarded, as a result of the annual inspection of roadway, stations, shops and pump houses, on the Oregon Short Line and the lines of the Southern Pacific, east of Sparks, Nev., which are also under Mr. Davis' authority. For the best district, J. E. Toombs, Roadmaster, gold medal; for the best section, Patrick Brennan, Foreman, gold medal; for the best section on each roadmaster's district, silver medals to E. Delahunty, W. P. Stewart, Mike Rush, J. Gildea, T. Leonard, M. Moran, Walter Read, J. C. Patterson, F. Sheridan, A. Quilici, J. A. Collins, Tom Fox, M. Harte. For perfect stations, gold medals to Mrs. M. P. Kalb, J. L. Kosta, Mrs. J. R. Hague, Mrs. M. E. Collins, L. A. Fulkerson. For perfect pumping stations, silver medals to C. A. Manning, F. Eads, James Whalen and Ephraim Hull.

The first named gold medal for a perfect station goes to Midlake, which is in the middle of Great Salt Lake, 10 or 15 miles from shore. We do not wish to detract from the honor due to Mrs. Kalb, but probably it will be only fair to some of the other agents to observe that very likely she had a minimum of trouble from untidy loafers.

Disastrous Collision at Dotsero, Colorado.

In a butting collision between a westbound passenger train and an eastbound freight on the Denver & Rio Grande, near Dotsero, Colo., on the night of January 15 at 9.47 o'clock, 21 passengers were killed and 40 passengers and several trainmen were injured. The passenger train had an order to wait at Dotsero until 9.55, but, in violation of the order, passed

there at 9.46 and met the freight about 80 rods west of the west switch. The passenger train consisted of engine, tender, baggage car, two coaches, tourist sleeping car and three or four standard sleeping cars. The freight was drawn by two engines. The passenger train was running down grade at high speed, and the collision was unusually violent, two of the engines, minus their wheels, being left standing locked together in a vertical position. Most of the persons killed were in the chair car and the tourist car, both of which were completely wrecked. The collision occurred on a curve where a high bluff made the view very short. The passenger engineman and conductor are said to have been experienced men.

Safety Appliance Law on the Panama Railroad.

President Roosevelt has issued an order, to go into effect not later than July 6, extending the Federal safety appliance laws—requiring the use of automatic couplers, automatic brakes, driving wheel brakes, drawbars of standard height, etc.—to the Canal Zone, and in particular to the Panama Railroad; and also to the railroads and cars operated by the United States government in navy yards, arsenals, government wharves, etc. Secretary Moseley, always alert to see that the safety appliance laws shall have the utmost possible influence, called the President's attention to the lack of safety appliances on the Panama Railroad, and in government establishments, and the thing was done; Mr. Roosevelt at once issued his order. The order also directs that in the territory mentioned all carriers shall make the ladders, running boards, sill steps, roof hand holds and brake shafts conform to the standards of the Master Car Builders' Association.

Hearings in Suit to Restrain Union Pacific.

The suit begun by the government some months since to dissolve the ownership by the Union Pacific of stock in the Southern Pacific and other lines as illegal under the Anti-trust law, has long been in abeyance because of the illness of the chief counsel for the roads; but the taking of testimony was resumed in New York January 5 before Special Examiner Williams.

The first witness was Paul Morton, who was Vice-President of the Atchison, Topeka & Santa Fe for eight years up to 1904. Mr. Morton testified to the relations of his road with the Union Pacific and the Southern Pacific before the Union controlled the Southern.

Edwin Hawley, who was the New York agent of the Southern Pacific for many years, testified that before the control of the S. P. by the U. P. there was actual competition between the Union Pacific, taking passengers and freight westward from Omaha, and the Southern Pacific taking traffic westward from New Orleans; but the Union Pacific could not make transcontinental rates without consulting the Southern Pacific.

Frank M. Murphy, President of the Santa Fe, Prescott & Phoenix, testified that the Phoenix & Eastern was projected in the interest of the Atchison, Topeka & Santa Fe, with a view to making a through line on a favorable location to the Pacific coast, but that after the work had progressed some time the Southern Pacific had bought the Phoenix & Eastern and thus prevented the Atchison from building an independent line westward. According to the newspaper reports of the testimony, Mr. Harriman and his associates forced the Atchison to sell out the Phoenix & Eastern in 1906. The Harriman interests had bought $30,000,000 worth of stock of the Atchison road, without the knowledge of the Atchison directors. Then, getting a representation in the Atchison board, an agreement was made for co-operation between the Southern Pacific and the Atchison in northern California, where the two companies had projected competing lines. The questions asked by the government seemed designed to show that since the Harriman purchase of the Atchison stock, the Union Pacific and the Atchison have become practically a combination, but the testimony was inconclusive.

Jacob H. Schiff, a member of Kuhn, Loeb & Company, which firm is one of the defendants in the suit, testified that he, with Mr. Harriman, tried to prevent the acquisition of the Chicago, Burlington & Quincy by the Great Northern and the Northern Pacific. In this they were unsuccessful. Then they tried to have the Union Pacific admitted to a participation in the purchase; but this was also unsuccessful. But Kuhn, Loeb & Company thereafter acquired a majority of the stock of the Northern Pacific and sold it to the Harriman interests, and the Burlington was kept from falling into the complete control of the Hill interests. Asked if the object of controlling the Northern Pacific was to control the Burlington, and thus eliminate a competitor, Mr. Schiff replied that it was not.

Stuyvesant Fish, formerly President of the Illinois Central, said that up to 1901 the Union Pacific and the Southern Pacific were active competitors for westbound transcontinental traffic—the Union at Omaha and the Southern at New Orleans.

E. T. Jefferey, President of the Denver & Rio Grande and the Western Pacific, testified that before the Union Pacific controlled the Southern Pacific the Rio Grande had enjoyed a free interchange of traffic with the Southern Pacific at Ogden, but that since then the Union Pacific is always favored on eastbound business at the expense of the Rio Grande.

Victor Morawetz gave testimony showing how Mr. Harriman and his associates demanded and secured representation on the board of directors of the Atchison, Topeka & Santa Fe, after which they were able to thwart the efforts of the Atchison to secure an independent line to all parts of California. Mr. Morawetz was called by the defense and his testimony was evidently designed to show that the friendly relations which were established between the Southern Pacific and the Atchison were not inimical to the public interest.

James Douglas, President of the El Paso & Southwestern, gave testimony confirming that of Mr. Murphy, tending to show that the Southern Pacific hampered the construction of the railway in the San Pedro valley.

Anti-Railway Agitation in Texas.

In spite of the fact that railway development in Texas is at a dead stand, agitation against the railways by the politicians and shippers of that state continues. Governor Campbell has recommended the passage of a 2-cent fare law and a so-called Galveston differential bill has been introduced in the legislature, which would operate largely to reduce the freight earnings of the Texas lines. Meantime the State Railway Commission is considering a motion by Chairman Mayfield for a reduction in cotton rates.

A conference of operating officers and representatives of employees of the railways in Texas was held at Ft. Worth on January 15. W. B. Drake, Vice-President and General Superintendent of the St. Louis, San Francisco & Texas, who presided at the meeting, said that no combination of employers and employees had been formed to resist hostile legislation. It was a meeting of general managers, he said, to discuss the oppressive measures which confront the roads in Texas, and representatives of the employees were invited to meet with the general managers that they might be better acquainted with conditions. The proposed 2-cent fare bill, the Galveston differential bill and reduction in cotton rates in Texas would reduce earnings of Texas lines about $5,500,000 a year, Mr. Drake said, and it was easy to see that employees would suffer as well as employers.

Fine of $1,549,500 Upheld by Supreme Court.

On Monday last the United States Supreme Court affirmed the decision of the Texas courts in the Waters-Pierce Oil Company case, which resulted in the imposition of a fine of $1,549,500 upon the company for violation of the state anti-trust law. This puts the court on record as in favor of a stringent and literal interpretation of anti-trust legislation, and as disposed to recognize a great scope of authority in the states in their attempts to control combinations by an application of the general powers of the federal constitution. Discussing the claim that the acts complained of are vague, indefinite and uncertain, the court refers to the decision in the Northern Securities case, in which it was said "that to vitiate a combination such as the act of Congress condemns, it need not be shown that the combination in fact results or will result in a total suppression of trade or in a complete monopoly; it is only essential to show that by its necessary operation it tends to restrain interstate or international trade or commerce or tends to create a monopoly in such trade

or commerce and to deprive the public of the advantages that flow from free competition."

The court finds that there was not sufficient evidence to show that there had been a deprivation of property without due process of law. As to the alleged excessive character of the fines, this is said to be entirely within the police power of the state unless large enough to amount to confiscation. That such is not the case is said to appear from the highly profitable character of the business done in the state.

Steam and Electric Mergers in Massachusetts.

The Massachusetts State Railroad Commission, replying to an order of the Senate of June 12 last regarding the general proposition of consolidation of the steam and electric transportation interests of the state, the consolidation of the steam and electric interests in Berkshire county alone, and the absorption of the Bennington & North Adams street railway by the Berkshire Street Railway Company, on January 18 gave a decision favorable to the last named proposition, but against the other two. As to the general relations between steam roads and street railways it is impossible to forecast the future, but a careful study of the past and present leads to the conclusion that the present policy of keeping the two separate is entirely consistent with the public interest. There is no occasion for a law to forbid a railway chartered in Massachusetts to hold stock in the Berkshire Street Railway Company for the reason that there is no legal authority for such holding. No occasion exists for passing a special law to permit it. It has been argued that a steam road, in control of this street railway, would help its finances; but on that theory all the street railways in the state ought to be put into the hands of the steam roads.

The policy of the state in the past in permitting consolidations of street railways appears to have been justified by experience, and, therefore, the board approves the purchase of the B. & N. A. by the Berkshire company.

Railway Business Association.

At the annual convention of the National Boot & Shoe Manufacturers Association, recently held at the Hotel Astor, New York City, the following resolutions were adopted:

"Whereas, It is evident that holders of capital, abroad and at home, are apprehensive that public hostility to railroads will result in legislation dangerous to the safety of railroad investments, and enormous sums of money must be borrowed by our railroads if they are to put themselves in shape to handle the growing traffic of the country; and

"Whereas, The restoration of prosperity to all lines of manufacture and trade would be greatly promoted if railroads could find a market for their securities and resume the construction of trackage and the purchase of equipment; therefore be it

"Resolved, That the National Association of Boot and Shoe Manufacturers, while deprecating many practices of the railroads, and insisting that regulation should continue to assure obedience to the laws and equitable treatment of all citizens, urges Congress and the State Legislatures to make the most careful investigation before imposing restrictions upon railroads, and to consider railroad problems in a calm and judicial spirit which shall reassure investors and promote the development of transportation facilities to keep pace with the growth of business."

The action of this association is important, because it shows a feeling which is growing entirely outside of those lines of business which are intimately connected with the supplies which the railways themselves use. Other associations which have passed similar resolutions include the National Shoe Wholesalers' Association of the United States; Chicago Board of Trade; Battle Creek, Mich., Board of Control; Merchants Association of York, Pa., and the Board of Trade of Bristol, Va.-Tenn.

Tariff Commission Convention.

A call has been issued for a National Tariff Commission Convention, to be held in Chicago on February 16-18. The purpose will be to give expression to the public demand for the creation of a "permanent, non-partisan, semi-judicial tariff commission."

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; May 11-14, 1909; Richmond, Va.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Pl., New York; May 19, 1909; New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.

AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago; March 16-18, 1909; Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and Aug.; New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—C. L. Young, C. & N.-W. Ry., Chicago, Ill.; May, 1909; Detroit, Mich.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York; June 22-23; Montreal.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.

INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 62 Liberty St., New York; May, 1909; Louisville, Ky.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; June, 1909.

IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Iowa; 2d Friday in month, except July and August; Des Moines.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.

NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.

NORTH-WEST RAILWAY CLUB.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 15, 1909; Chicago.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio; May 17-19; Chicago.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

SOUTHERN AND SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs. Jan., April, Aug. and Nov.; Atlanta.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Central and Western Association of Car Service Officers.

The thirty-eighth annual meeting will be held at Chicago, Thursday, February 18, 1909, at the Great Northern hotel. Members are requested to send to the Secretary any subjects considered worthy of consideration. It is intended, in addition to the reports of the committees, to outline a programme. W. E. Beecham, Secretary, 194 Fullerton avenue.

Local Freight Agents' Association of Chicago.

At the annual meeting, held on January 8, officers for the ensuing year were elected as follows: President, N. W. Pierce, Local Freight Agent, Chicago, Milwaukee & St. Paul; Vice-President, E. D. Casey, Local Freight Agent, Chicago & Alton; Secretary and Treasurer, C. B. Strohm, Local Freight Agent, Atchison, Topeka & Santa Fe.

Southern & Southwestern Railway Club.

At a meeting held at the Piedmont hotel, Atlanta, Ga., on January 21, the subject of headlights was concluded.

Wood Preservers' Association.

The United States Wood Preservers' Association held its annual meeting this week at the Auditorium Hotel in Chicago.

There were no committee reports or prepared papers, the programme, instead, consisting of topical discussions and addresses on subjects of interest to the members.

Railway Storekeepers' Association.

The sixth annual meeting will be held at the Auditorium hotel, Chicago, May 17, 18 and 19, 1909.

Northwestern Cement Products Association.

The fifth annual convention will be held in the Armory, Minneapolis, Minn., on March 2, 3 and 4. The association has been incorporated in Minnesota by Martin T. Roche and D. L. Bell, of St. Paul, C. A. P. Turner, O. U. Miracle and J. C. Van Doorn, of Minneapolis. Mr. Van Doorn is the secretary of the association.

Traffic News.

The United States Shippers' Protective Association has been organized at Nashville, Ill., to collect claims for its members and to "protect shippers against unjust discriminations."

The annual dinner of the Traffic Club of Chicago will be given on the evening of January 26 at 7 o'clock at the Congress Hotel. The dinner will be preceded by a reception at 6.30.

The Interstate Commerce Commission has granted the petition of the Atchison, Topeka & Santa Fe for a re-hearing in the matter of free transportation of commodities for the use of hotels.

The South Dakota Senate has passed a 2-cent fare bill. It is said that this bill will be hurried through the House and signed by the governor. The railways are now contesting the validity of the 2½-cent fare that is in effect in that state.

At the annual dinner of the Calgary (Alberta) Board of Trade, A. Price, General Superintendent of the Canadian Pacific, announced that outgoing freight in 1908 showed an increase of 13 per cent. over 1907 and was three times that of 1903.

The St. Louis Southwestern having applied to the Railroad Commission of Louisiana for permission to use on intrastate shipments the uniform bill of lading recommended by the Interstate Commerce Commission, the Louisiana Commission has announced it will hold a general hearing on this subject at Baton Rouge on January 27.

Hermann, Aukam & Co., dry goods merchants, pleaded guilty in the United States Circuit Court at New York January 13 to violating the law by false billing of linens as calico to secure cheaper freight rates. Judge Chatfield imposed a fine of $1,000, which was paid. The prosecution was conducted by the Interstate Commerce Commission, and the indictment was returned October 31.

The railways have decided to equalize grain rates from the Northwest and West to the Southeast via Chicago with rates via other gateways, such as Peoria, Memphis, St. Louis and Louisville. Grain moving via Chicago from the West and Northwest to the Southeast has heretofore been charged a rate from 2½ to 4 cents per 100 lbs. higher than when moving through other gateways. Grain from the territory in northern Iowa and from points north and west of Omaha is affected. The new rates will be checked in as rapidly as possible.

Evidence is being taken at Chicago by J. L. Bennett, Special Master of the Federal court, in the suit brought by the railways to restrain the Interstate Commerce Commission from enforcing its order for a reduction of proportional rates between the Mississippi and Missouri rivers on classified commodities moving from New York to the Missouri river. Representatives of the railways have given testimony to show that the order of the Commission will if enforced cause a discrimination against Chicago, St. Louis and other intermediate points, in favor of the shippers on the Atlantic seaboard and at Missouri river points.

Suit has been brought in a state court at Louisville, Ky., by M. Sabel & Son against the Pennsylvania, the real purpose of which is to compel this road to load carload shipments of goods. Sabel & Son delivered a carload of green hides to the Pennsylvania for shipment to Olean, N. Y., dumping them on the station platform and demanding the carload rate. The road refused to issue a bill of lading unless the shipper loaded the goods into a car, and the shipper got a temporary mandatory injunction to compel issuance of the bill of lading. The case will test in the courts the legality of the recent action of roads in various parts of the country in making a rule that they will not load and unload shipments hauled at carload rates.

Counsel for the Chicago & Alton and for John N. Faithorn and F. A. Wann filed a petition in the United States Supreme Court at Washington on January 19, for a rehearing in the case in which these defendants were fined for the alleged granting of rebates to the Schwarzschild & Sulzberger Co. at Kansas City. The following extracts give the substance of the petition: "Within the past few years the carrier companies have been overwhelmed with a mass of new legislation creating new crimes. In the very nature of things competent and painstaking men are confronted with doubtful conditions on which judgment and decision must be quickly exercised. Sane though they be, they sometimes err. But in any event the very fact that this court was evenly divided on the question of the petitioners' guilt or innocence, demonstrates that they could not have known in advance that their acts were crimes. In fact, they do not now know what the law is on the questions involved. In fact, it seems that the law is so uncertain that the court itself has not up to the present time succeeded in interpreting it. It may well be asked, if eight of the justices of the Supreme Court of the United States are equally divided as to the interpretation of a criminal statute of Congress, how can the layman, be he traffic man or shipper, and be he ever so earnest in wishing to obey the law, avoid its traps and pitfalls?"

The Pennsylvania Railroad, on January 11, announced that all interstate school tickets would be withdrawn February 10, in compliance with the ruling of the Interstate Commerce Commission. The notice said that the company took this action with regret. On the following day the president of the road received a letter from Chairman Knapp telling him that the notice did not fairly state the case. The commission had condemned the issue of school tickets which were without an age limit but were limited to schools of a certain kind or class, but had not "required the withdrawal of reduced rates for school children." Where school tickets have been withdrawn by the railways, the action has been voluntary, the carriers apparently preferring to do this rather than remove the "glaring discriminations." To this letter Vice-President Thayer, of the Pennsylvania, replied, through the newspapers, that the essential point in the ruling of the commission—that persons not attending school must have the same privilege as those attending—still remained in effect. The commission had suggested that reduced rate tickets, if issued, should be limited to certain ages, but the road could not afford to grant the school-rate reduction to everybody, and it would be impossible to check the age of the user. Such tickets would place a premium on dishonesty. Furthermore, the New York State authorities had recommended the continuation of the sale of school tickets between points within that state. The Pennsylvania regrets that the commission should assume that any disrespect or criticism was intended by its action.

INTERSTATE COMMERCE COMMISSION.

In defining its meaning in a recent meeting in regard to reduced rates to clergymen the Interstate Commerce Commission says that a clergyman does not lose his ministerial standing because he leaves the pastorate for some other field of religious activity. A minister who becomes editor of a church paper, instructor in a theological seminary, financial agent for a church or other religious institution, or who engages in other work which may fairly be regarded as religious

in character, and who does not abandon his ministerial work, may legally be accorded special transportation privileges. The courts have been consistently liberal in giving construction to the words "charitable" and "eleemosynary," and the commission sees no reason for being unduly narrow in interpreting these words as found in the act. A charitable institution is one which is administered in the public interest, and in which the element of private gain is wanting. This definition is broad enough to include hospitals, almshouses, orphanages, asylums, and missionary societies. This enumeration is not intended to be exclusive—it is only representative. It is important to note that such an institution does not necessarily lose its charitable character because it is under the management of a particular denomination or sect, or because a charge is collected from some or all of those who enjoy its privileges. It is only necessary that it be conducted in the public interest and not for private gain.

STATE COMMISSIONS.

The California Railroad Commission on January 12 handed down a decision fining the Atchison, Topeka & Santa Fe $5,000 for failure to conform to the rates fixed by the Commission. It also held that several of the rates of the Santa Fe and Southern Pacific were unjustly discriminatory and exonerated the San Pedro, Los Angeles & Salt Lake from charges of having in effect similar rates. The offense for which the Santa Fe was fined was the alleged refunding to the Associated Oil Company of $30,750 on shipments of oil from Bakersfield to San Francisco, Stockton, and other places. The Commission had fixed a rate of 37.8 cents a barrel and it was alleged that the Santa Fe gave the Associated Oil Company a rate of 25 cents.

COURT DECISIONS.

Authority of State Court Over Interstate Commerce.

The Supreme Court of the United States last week, in the case of the Missouri Pacific, plaintiff in error, against the Larabee Flour Mills, sustained the Supreme Court of Kansas in a decision regulating interstate commerce; that is to say, in issuing a peremptory mandamus compelling the road to perform its duty as a common carrier, the traffic being interstate. The decision was by Justice Brewer, but Justices Moody and White dissented.

The mill company had disputed a demurrage bill, contending that the delay in handling the cars in question was due to the fault of the road. The road thereupon discontinued its previous practice of hauling cars between the spur track of the mill and the Santa Fé road, about a mile distant. The mill company applied to the Supreme Court of Kansas for relief and that court under the common law ordered the railway to resume the transfer of cars as before. The railway appealed.

The mill company has for more than four years been operating a flouring mill of 1,000 barrels daily capacity. About three-fifths of its product is shipped out of the state of Kansas into other states and the remaining two-fifths to points within the state. It receives a large portion of its grain in carload lots over the two roads.

No express contract existed between the two railway companies requiring either to use or to permit the other to use the transfer track, or requiring either to place empty or loaded cars thereon to be taken away or returned by the other. Whenever the Santa Fe placed its empty cars for the mill company on the transfer track, the Missouri Pacific, upon notice thereof, hauled and delivered them at the mill. The Santa Fe and the Missouri Pacific both held themselves out as ready to do such and like transferring, and continued to do so after the controversy arose in this case for all industries located on the Missouri Pacific at that place (Stafford), making carload shipments in or out over the Santa Fe, except the mill company. But the Missouri Pacific, for a failure to pay the demurrage, ceased and refused to make further delivery to the mill company of empty cars from the Santa Fe, in consequence of which the mill company, when desiring to ship any of its products from Stafford by the Santa Fe, was compelled to haul the same in wagons from its mill to the station of the Santa Fe and there load into cars. The refusal of the Missouri Pacific was based solely upon the ground above stated, and not on any claim that the compensation paid for the service was unsatisfactory, or that the service constituted a part of interstate commerce, or that the Missouri Pacific did not undertake to perform services of such character.

The commissioner appointed by the court found that the detention of the cars on account of which the demurrage charge was refused payment by the mill company was caused as much by the defective motive power and insufficient train service of the Missouri Pacific as from any fault or omission on the part of the mill company.

The Supreme Court of the state ordered the Missouri Pacific to immediately resume the transfer and return of cars loaded and unloaded from the line of the Santa Fe to and from the mill.

Justice Brewer says: "Counsel for plaintiff in error contend that no duty was imposed on the railway company by act of the legislature or mandate of commission or other administrative board. Conceding this, it is also true that the Missouri Pacific was a common carrier, and as such after this controversy arose continued transferring for all industries except the mill company. So long as it engaged in such transfer it was bound to treat all industries at Stafford alike. No legislative enactment, no special mandate from any commission, or other administrative board was necessary, for the duty arose from the fact that it was a common carrier. This lies at the foundation of the law of common carriers. Neither is there any significance in the absence of a special contract between the Missouri Pacific and the mill company. It appears that the practice theretofore had been for the Missouri Pacific to charge the Santa Fe for the transfer.

"But the main contention on the part of the Missouri Pacific runs along an entirely different line. It is that the Missouri Pacific and the Santa Fe are common carriers, engaged in interstate commerce, and as such are subject to the control of Congress, and, therefore, in these respects not amenable to the power of the state. It appears from the findings that about three-fifths of the flour of the mill company is shipped out of the state, while the other two-fifths is shipped to points within the state. In addition, the hauling of the empty cars from the Santa Fe track to the mill was, if commerce at all, commerce within the state.

"The roads are, therefore, engaged in both interstate commerce and that within the state. In the former they are subject to the regulation of Congress; in the latter to that of the state, and to enforce the proper relation between Congress and the state the full control of each over the commerce subject to its dominion must be preserved. How the separateness of control is to be accomplished it is unnecessary to determine. * * * This case does not rest upon any distinction between interstate commerce and that wholly within the state. It is the contention of counsel for the mill company that it comes within the oft-repeated rule that the state, in the absence of express action by Congress, may regulate many matters which indirectly affect interstate commerce, but which are for the comfort and convenience of its citizens. Of the existence of such a rule there can be no question. It is settled and illustrated by many cases. (Cooley v. Board of Wardens of Port of Philadelphia, 12 How. 299; Sturges v. Crowinshield, 4 Wheat. 193; Houston v. Moore, 5 Wheat. 1; Wilson v. Blackbird Creek Company, 2 Pet. 251; Cleveland, etc., Ry. Co. v. Illinois, 177 U. S. 514.)

"On the other hand, it is said that Congress has already acted, has created the Interstate Commerce Commission, and given to it a large measure of control over interstate commerce. But the fact that Congress has entrusted power to that commission does not, in the absence of action by it, change the rule which existed prior to the creation of the commission. A mere delegation by Congress to the commission has no greater effect, and does not of itself disturb the authority of the state. It is not contended that the commission has taken any action in respect to the particular matters involved. It may never do so, and no one can in advance anticipate what it will do when it acts. Until then the authority of the state in merely incidental matters remains undisturbed. In other words, the mere grant by Con-

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF NOVEMBER, 1908.
(See also issues of January 8 and 15.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses					Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance Way and structures.	Maintenance Of equipment.	Traffic.	Transportation.	General.	Total.				
Alabama & Vicksburg	143	$94,778	$40,397	$145,627	$17,569	$32,393	$3,298	$44,238	$4,978	$102,476	$43,151	$1,844	$4,760	$40,235	$440
Alabama Great Southern	309	193,981	70,655	295,712	40,172	58,207	7,422	98,796	7,946	212,543	83,169	1,653*	11,490	70,026	34,500
Ann Arbor	301	107,668	36,947	153,802	17,829	18,157	3,180	63,277	3,907	106,350	47,452	3,450	11,369	39,533	16,129
Bangor & Aroostook	515	172,761	45,222	227,403	43,514	26,495	2,830	70,399	11,593	154,831	72,572	.....	1,500	71,072	29,140
Buffalo, Rochester & Pittsburgh	568	463,356	66,128	547,945	63,375	133,936	7,909	174,991	17,002	397,213	150,732	181	15,000	135,913	‡42,118
Central Branch	388	103,200	25,049	137,991	20,592	21,730	3,515	49,897	4,256	99,991	38,000	.....	9,500	28,500	20,005
Central Vermont	411	194,153	67,467	283,958	50,535	51,360	6,637	137,949	6,774	253,255	30,703	150	9,025	21,828	‡21,388
Chicago Great Western	818	487,888	142,255	685,151	107,352	130,695	13,218	148,277	28,935	632,472	52,679	2,060*	20,790	29,829	‡65,844
Chicago, Indianapolis & Louisville	616	290,683	103,972	433,785	57,568	66,667	35,519	329,971	13,493	299,223	134,562	.....	21,500	113,062	50,322
Cincinnati, N. Orleans & Texas Pacific	337	483,954	109,599	625,509	70,522	102,990	16,431	199,335	17,838	407,116	218,393	191	19,642	198,942	74,877
Detroit, Toledo & Ironton	486	122,334	13,158	142,824	24,383	25,366	2,632	69,982	3,965	126,328	16,496	27*	6,979	9,490	9,855
Duluth, South Shore & Atlantic	593	143,204	74,720	232,191	29,038	28,064	7,274	88,399	5,980	158,755	73,436	652	15,000	59,088	11,481
Florida East Coast	584	119,436	54,657	200,063	36,311	35,129	7,345	78,130	12,103	169,018	31,045	.....	11,000	20,045	23,261
Georgia Southern & Florida	395	90,028	45,452	156,677	16,065	23,022	4,973	61,827	8,676	114,563	42,114	1,345	9,951	33,508	12,352
Grand Trunk Western in U. S.	336	287,445	128,784	440,984	42,839	50,844	18,452	189,759	9,937	311,831	129,153	1,982*	32,000	95,171	‡7,083
Hocking Valley	347	477,431	66,052	560,601	50,962	139,071	7,593	172,254	11,818	381,698	178,903	12,865	20,106	171,662	2,775
International & Great Northern	1,159	641,060	147,422	834,642	148,574	113,834	16,496	314,977	19,935	613,816	220,826	.....	23,000	197,826	165,913
Iowa Central	558	184,741	37,170	233,686	21,049	65,020	8,060	120,036	8,783	222,948	10,738	.....	7,359	3,379	‡68,601
Lake Erie & Western	724	279,273	52,427	350,854	50,175	63,605	9,134	141,366	9,573	273,853	77,001	.....	17,380	59,621	9,215
Lehigh Valley	1,446	2,526,917	275,954	2,901,677	294,359	533,221	66,852	906,910	45,291	1,846,633	1,055,044	3,298	94,600	963,742	‡93,114
Long Island	391	225,142	323,085	565,914	62,806	100,336	15,184	302,631	20,283	501,240	64,674	56,638	21,713	99,599	53,543
Minneapolis & St. Louis	1,027	261,001	76,255	363,531	27,745	45,512	8,443	136,390	17,122	235,212	128,319	.....	13,776	114,543	8,359
Minneapolis, St. P. & Sault Ste. Marie	2,308	840,433	254,473	1,143,496	89,589	111,937	18,174	332,478	27,448	579,626	563,870	24,415	82,613	505,672	154,766
Missouri Pacific	3,492	1,294,348	291,908	1,765,878	255,803	314,159	45,853	792,806	62,462	1,471,083	294,795	2,523*	77,105	215,167	17,455
New York, Ontario & Western	546	520,425	80,374	640,987	66,646	118,756	9,643	258,696	17,491	471,232	169,755	15,293*	15,417	139,045	‡24,532
Norfolk & Southern	582	137,059	45,046	195,490	22,714	20,527	3,181	63,116	15,404	124,942	70,548	736*	6,800	63,012	28,770
Northern Central	473	779,722	156,490	995,221	54,880	253,698	10,608	440,409	19,062	778,657	216,264	567	19,515	197,616	‡23,915
Northwestern Pacific	373	92,264	109,331	221,464	56,402	31,697	1,811	88,809	9,205	187,924	33,540	.....	8,955	24,585	9,183
Rutland	468	142,225	72,358	241,698	29,215	32,090	5,855	90,606	5,182	162,948	78,750	.....	11,907	66,843	28,252
St. Louis, Brownsville & Mexico	456	66,508	28,425	101,822	17,884	11,151	2,670	39,122	6,844	77,671	24,151	1*	3,000	21,150	4,966
St. Louis, Iron Mountain & Southern	2,609	1,564,215	364,272	2,102,204	275,379	287,178	40,839	681,344	60,679	1,345,419	756,786	3,345*	63,161	690,280	153,521
Southern Pacific Co.—Pacific System	5,583	4,623,226	2,157,044	7,230,431	771,741	949,702	122,726	1,857,832	191,324	3,893,325	3,337,106	38,230*	245,176	3,053,700	373,198
Texas & New Orleans	450	231,582	71,020	324,197	56,363	49,639	5,482	133,084	8,357	252,925	71,272	4,485*	7,405	59,382	16,235
Toledo & Ohio Central	441	311,900	49,154	372,156	55,264	68,707	5,227	126,784	4,655	260,637	111,519	2,709	14,696	99,532	‡38,961
West Jersey & Seashore	371	120,143	160,971	304,985	48,451	50,978	7,942	166,787	7,974	282,132	22,853	2,369	17,112	8,110	‡48,633
Wheeling & Lake Erie	442	377,766	42,337	458,275	87,880	131,040	4,450	169,920	15,031	408,321	49,954	375	21,583	28,747	‡44,888

FIVE MONTHS OF FISCAL YEAR.

Alabama & Vicksburg	143	$403,209	$192,647	$640,380	$100,769	$137,911	$16,016	$211,541	$24,154	$490,391	$149,989	.....	$19,160	$130,829	‡$18,782
Alabama Great Southern	309	934,199	420,233	1,494,784	193,407	299,238	37,268	493,381	43,231	1,066,525	428,259	$3,557*	57,328	367,374	92,816
Ann Arbor	301	500,343	222,617	774,837	111,271	102,685	15,699	281,268	20,316	531,239	243,598	15,462	56,844	202,216	‡28,380
Bangor & Aroostook	515	848,334	274,015	1,180,511	223,572	135,263	14,289	347,761	50,555	771,440	409,071	.....	7,500	401,571	125,611
Buffalo, Rochester & Pittsburgh	568	2,599,104	417,414	3,166,175	471,030	730,274	42,440	911,862	69,695	2,225,301	940,874	110	75,000	865,984	‡349,917
Central Branch	388	570,987	150,412	776,209	110,302	89,787	14,720	243,233	18,776	476,818	309,959	.....	47,500	251,891	86,045
Central Vermont	411	930,667	512,605	1,556,780	253,504	244,319	33,248	675,690	148,600	1,246,821	683,017	5,461	45,125	270,295	‡64,494
Chicago Great Western	818	2,490,676	903,463	3,664,173	544,342	597,092	182,485	1,508,637	66,216	2,981,156	1,056,267	4,187*	92,241	586,589	‡83,534
Chicago, Indianapolis & Louisville	616	1,527,240	615,990	2,355,029	386,676	337,744	62,978	726,491	86,243	1,580,105	774,924	.....	107,500	667,424	‡88,595
Cincinnati, N. Orleans & Texas Pacific	337	2,476,088	601,972	3,243,158	382,592	663,977	80,951	1,056,267	23,078	2,186,891	127,203	8,825*	98,210	92,085	177,202
Detroit, Toledo & Ironton	486	627,608	74,815	741,840	119,137	161,847	12,316	973,128	34,956	614,637	346,705	224*	34,894	281,166	68,069
Duluth, South Shore & Atlantic	593	674,599	425,342	1,170,629	193,588	132,473	47,398	298,258	43,987	823,924	81,132*	9,461	75,000	136,132†	‡75,881
Florida East Coast	584	437,282	250,370	809,379	223,411	206,242	23,262	415,509	43,658	890,511	224,826	.....	55,000	191,842	‡34,324
Georgia Southern & Florida	395	432,803	249,628	774,547	56,234	138,646	25,093	393,609	65,228	549,721	810,148	7,173	40,157	646,323	74,121
Grand Trunk Western in U. S.	336	1,484,515	803,139	2,416,494	216,014	340,941	106,155	286,089	58,811	1,606,346	1,132,724	3,825*	160,000	1,080,858	189,124
Hocking Valley	347	2,535,349	397,838	3,016,051	297,412	526,718	37,939	878,008	101,940	1,883,327	981,914	50,794	102,660	866,914	27,810
International & Great Northern	1,159	2,589,355	748,718	3,558,326	532,608	217,518	74,996	818,621	42,932	2,576,412	304,333	.....	115,000	267,300	694,217
Iowa Central	558	972,248	239,284	1,272,458	126,967	341,482	43,475	1,340,150	50,523	968,125	468,973	.....	37,033	383,593	‡172,502
Lake Erie & Western	724	1,428,563	385,388	1,912,773	280,858	2,660,260	57,334	537,233	254,907	1,443,800	5,496,009	3,015	85,380	5,062,024	‡157,394
Lehigh Valley	1,446	12,095,315	1,864,730	14,416,341	1,480,319	497,675	321,230	713,603	91,762	8,920,332	1,174,525	475,291	437,000	1,541,248	‡1,126,761
Long Island	391	1,128,647	2,576,261	3,867,554	445,375	217,112	78,666	4,203,616	60,747	2,693,029	755,787	41*	108,568	678,784	242,671
Minneapolis & St. Louis	1,027	1,258,592	528,392	1,909,061	186,860	582,408	48,811	1,579,551	116,501	1,153,274	2,873,070	147,549	76,962	2,602,594	40,499
Minneapolis, St. P. & Sault Ste. Marie	2,308	4,218,656	1,418,781	5,889,634	576,647	1,332,216	85,413	639,744	307,712	3,016,564	2,727,114	6,790*	418,025	2,334,799	661,788
Missouri Pacific	3,492	6,859,528	1,792,194	9,535,333	1,221,996	599,649	227,663	1,655,595	72,318	6,808,219	1,298,614	16,321*	385,525	1,205,210	262,862
New York, Ontario & Western	546	2,679,359	873,873	3,705,237	423,348	106,554	48,919	3,718,632	78,659	2,406,623	270,051	2,214	77,083	238,265	‡94,871
Norfolk & Southern	582	586,916	279,786	940,870	158,338	991,178	21,741	1,262,389	95,089	670,819	1,346,632	4,221	34,000	1,253,280	72,490
Northern Central	473	3,761,766	900,354	4,938,333	323,834	181,873	63,582	305,527	45,969	3,591,701	469,022	.....	97,573	423,147	‡198,059
Northwestern Pacific	373	598,578	794,595	1,497,196	310,092	158,958	11,269	2,118,018	28,294	1,028,174	438,202	.....	45,875	290,188	‡69,476
Rutland	468	677,941	503,619	1,313,761	180,742	60,121	31,445	478,971	24,979	875,559	105,625	.....	48,014	90,697	55,323
St. Louis, Brownsville & Mexico	456	288,507	134,685	455,920	83,636	1,227,654	13,607	476,120	291,104	350,295	3,363,031	72	15,000	187,173	100
St. Louis, Iron Mountain & Southern	2,609	6,953,805	1,864,741	9,624,267	1,339,028	4,182,106	210,102	167,952	950,149	6,261,236	16,150,976	11,179*	318,250	3,033,602	1,980,935
Southern Pacific Co.—Pacific System	5,583	21,781,653	11,337,258	35,356,660	4,354,793	4,182,106	537,447	3,193,348	26,155	19,205,684	386,509	28,491*	1,133,163	14,989,322	42,603
Texas & New Orleans	450	1,088,438	337,206	1,516,663	237,824	207,386	29,005	9,181,189	41,115	1,130,154	899,827	5,598*	44,568	336,343	122,268
Toledo & Ohio Central	441	1,830,037	301,389	2,197,607	292,790	317,792	62,335	617,674	27,243	1,297,780	871,803	24,544	69,751	854,620	‡185,443
West Jersey & Seashore	371	650,778	1,729,490	2,491,201	324,056	266,176	25,477	630,950	38,274	1,619,398	681,355	52,060	85,562	838,301	‡65,434
Wheeling & Lake Erie	442	2,167,908	236,742	‡573,580	378,883	583,154		928,557	70,139	1,892,225		3,062	110,736	573,681	

*Deficit. †Loss. ‡Decrease.

gress to the commission of certain national powers in respect to interstate commerce does not of itself and in the absence of action by the commission interfere with the authority of the state to make those regulations conducive to the welfare and convenience of its citizens. Running through the entire argument of counsel for the Missouri Pacific is the thought that the control of Congress over interstate commerce and a delegation of that control to a commission necessarily withdraws from the state all power in respect to regulations of a local character. This proposition cannot be sustained. Until specific action by Congress or the commission the control of the state over these incidental matters remains undisturbed. But it is further contended that this is not a mere incidental matter, indirectly affecting interstate commerce, but directly a part of such commerce, and therefore beyond the power of the state to control, and in support of that McNeill v. Southern Railway, 202 U. S. 543, is referred to. There are many points of resemblance between that case and this, but there is this substantial distinction: In that was presented and determined solely the power of a state commission to make orders respecting the delivery of cars engaged in interstate commerce beyond the right of way of the carrier and to a private siding—an order which affected the movement of the cars prior to the completion of the transportation, while here is presented, as heretofore indicated, the question of the power of the state to prevent discrimination between shippers, and the common law duty resting upon a carrier was enforced. This common law duty the state, in a case like the present, may, at least in the absence of Congressional action, compel a carrier to discharge."

Mr. Justice Holmes concurs in the judgment on the ground that the cars had not yet been appropriated to interstate commerce, and so were subject to state control. but is inclined to agree with the views of Justice Moody.

Mr. Justice Moody says: Upon the peculiar facts of this case, it is possible to say that the cars, whose transfer was directed, did not become the subjects of interstate commerce until they had been selected as such after their delivery upon the tracks of the Santa Fe Railroad. If the decision were put upon that ground, I should be silent.

But it is assumed that three-fifths of them were interstate shipments, and with respect to such shipments, I am constrained to believe that the judgment of the court below exceeded the power of the state. The division of the governmental power over commerce made by the Constitution, by which the control of interstate commerce is vested in the nation and the control of intrastate commerce is vested in the states, together with the fact that both kinds of commerce are often conducted by the same persons and corporations through the same agencies gives rise to highly perplexing questions in practice. The regulation of carriers and other instrumentalities of commerce is constantly undertaken both by the nation and the states, and the extent and limit of the respective powers vested in each government, as far as possible, ought to be accurately ascertained and declared. This is demanded imperatively by the orderly conduct of the vast transportation agencies which are engaged in both kinds of commerce. They ought not to be left uncertain as to the power to which they are responsible.

I venture to think that the weight of authority establishes the following principles: The commerce clause of the Constitution vests the power to regulate interstate commerce exclusively in the Congress and leaves the power to regulate intrastate commerce exclusively in the states. Both powers being exclusive, neither can be directly exercised except by the government in which it is vested. Though the state may not directly control interstate commerce, it may often indirectly affect that commerce by the exercise of other governmental powers with which it is undoubtedly clothed. And this indirect effect may be allowed to operate until the Congress enacts legislation conflicting with it, to which it must yield as the paramount power.

In the case at bar, upon the facts as they are assumed to exist, it seems to me that the judgment of the court below directly regulated interstate commerce. If this is so, it is unimportant that the Congress has been silent. A power clearly withdrawn from the state and vested in the nation, can no longer be exercised by the states, even though the Congress is silent. Where the Congress fails to act, the subject enjoys freedom from direct control.

The principles which I have stated have been recently applied by this court in the case of McNeill v. Southern Railway Company, 202 U. S. 543. I cannot escape from the conviction that that case requires a reversal of the judgment of the court below, so far as it assumes to direct the conduct of interstate commerce. In that case the place of business of a private corporation was reached by a spur track connecting with the main track of the railway. It had been the custom of the railway to deliver cars consigned to this corporation from the main track to the spur track. In consequence of a dispute concerning demurrage, the railway refused to continue thus to deliver cars. The state commission made an order requiring the railway to deliver certain cars engaged in interstate commerce upon the spur track on payment of freight charges. The order was held to be a regulation of such commerce, and repugnant to the commerce clause of the Constitution. In that case the regulation affected the last stages of the interstate journey. In this case it affects the first stages of the interstate journey. But in each case the commerce which was regulated was interstate. In that case the order was issued by a commission and in this case by a court. But nothing turns upon that distinction, for by whatever state agency the power is exercised it is void, because it exceeds the authority which may rightfully be conferred by the state upon any agency.

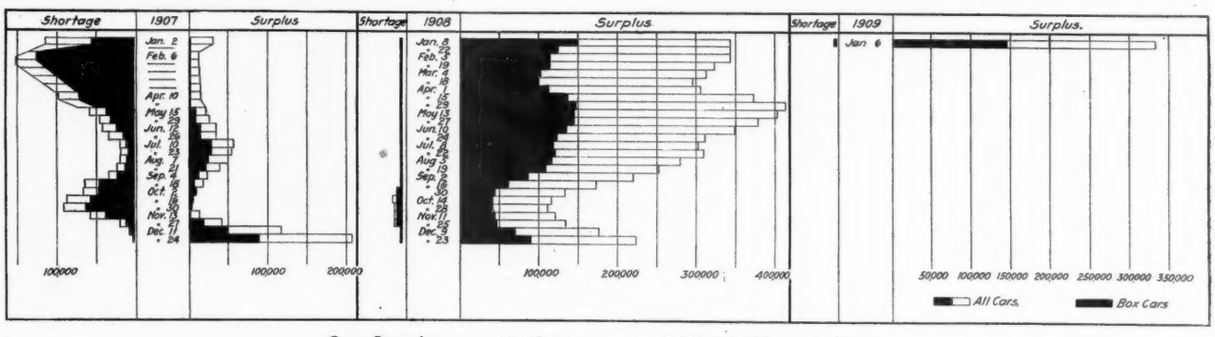
I am not ready to assent to the proposition that although the Congress has vested in the Interstate Commerce Commission the authority to deal with the exact situation presented to us, that fact is immaterial, because the commission has taken no action. If the commission has the authority to deal with a question of this kind, those who have grievances ought to resort to that body for relief. It is a very great hardship to subject the carriers to possibly conflicting regulations and leave them uncertain which government may rightfully assert its controlling authority.

Mr. Justice White joins in this opinion.

Car Surpluses and Shortages.

Arthur Hale, Chairman of the Committee on Car Efficiency of the American Railway Association, in presenting bulletin No. 39, giving a summary of surpluses and shortages by groups from December 24, 1907, to January 6, 1909, says:

"This report shows a total of 333,019 surplus cars, an increase of 110,942 in the two weeks since our last report. It



Car Surpluses and Shortages in 1907, 1908 and 1909.

will be noted that there was a similar increase shown in the corresponding report for 1908 and it is accounted for by the usual holiday recession. There was a further slight decrease in the number of shop cars, but as this item is now rather close to normal, large decreases cannot be expected. Taken by groups, the increase seems to be general. The large increase in group 11 (Canadian) is partly due to the addition of 5,000 cars reported by a line that had no report for several previous periods."

The accompanying chart shows the surpluses and shortages in 1907, 1908 and 1909. The table shows the surpluses and shortages in the period covered by the report.

Car Surpluses and Shortages, from December 24, 1907, to January 6, 1909, Inclusive.

Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
January 6, 1909	156	146,255	25,383	117,686	43,695	333,019	170	202	120	14	506
December 23, 1908	158	87,350	16,247	79,595	38,885	222,077	471	42	289	217	1,019
December 9, 1908	161	67,550	15,336	58,816	33,941	175,643	1,134	73	276	196	1,679
November 25, 1908	160	45,194	12,157	43,854	31,624	132,829	7,923	178	900	209	9,210
October 28, 1908	158	39,383	10,185	31,541	29,803	110,912	8,175	167	2,261	236	10,839
September 30, 1908	160	42,593	10,365	49,795	31,039	133,792	7,313	450	224	127	8,114
August 19, 1908	160	106,367	13,494	92,500	40,642	253,003	465	90	105	194	854
July 22, 1908	166	120,580	14,401	125,739	47,960	308,680	115	37	330	27	509
June 24, 1908	163	123,112	18,042	130,149	41,995	313,298	266	34	120	31	451
May 27, 1908	160	144,697	20,075	162,695	54,437	381,904	82	13	12	18	125
April 29, 1908	159	147,971	24,350	186,742	59,542	413,605	145	42	16	64	267
March 18, 1908	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
February 19, 1908	161	113,776	30,088	134,217	44,432	322,513	697	141	249	162	1,249
January 22, 1908	161	124,622	27,328	142,388	48,292	342,580	392	132	79	135	738
December 24, 1907	158	87,714	14,740	64,556	42,300	209,310	187	81	191	265	724

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

J. M. Huffington has been appointed General Claim Agent of the Trinity & Brazos Valley, succeeding Ewing Boyd, resigned.

A. C. Goodyear, Purchasing Agent of the New Orleans Great Northern, has been elected to the new office of Third Vice-President.

John D. Caldwell, Secretary to the President of the Chicago & North Western, has been elected Secretary of that road, succeeding E. E. Osborn.

L. M. Buie, of Stamford, Tex., has been elected President of the Stamford & Northwestern; R. V. Colbert, Vice-President; L. B. Priton, Secretary, and S. M. Hudson, Treasurer.

L. E. Stafford has been appointed Auditor of the Orange & Northwestern, with office at Orange, Tex., succeeding J. J. McEwen, resigned to accept service with another road. J. W. McCullough has been appointed Assistant Auditor, with office at Beaumont, Tex.

W. C. Brown, President-elect of the New York Central & Hudson River, has been elected also President of the Michigan Central, succeeding W. H. Newman, effective February 1. Mr. Brown has been elected also President of the Rutland Railroad, succeeding Mr. Newman, effective at once.

Horace G. Burt will be elected President of the Chicago Great Western upon the reorganization of the road, which it is hoped will be arranged soon. This announcement was made by L. S. Cass, General Traffic Manager, at a hearing before the Iowa Railroad Commission on January 18. It was also stated by Mr. Cass that the other officers would be men now in the service of the road.

Operating Officers.

W. J. O'Brien has been appointed Superintendent of the Chicago Junction, with office in the Exchange building, Union Stock Yards, Chicago.

D. Woodring has been appointed Superintendent of Dining Car Service of the Wheeling & Lake Erie and the Wabash-Pittsburgh Terminal, with office at Canton, Ohio, succeeding J. B. Fox, resigned.

C. G. Dimmock, chief clerk in the office of the Assistant General Superintendent of the Chicago, Milwaukee & St. Paul, has been appointed Trainmaster of the Rocky Mountain division of the Chicago, Milwaukee & Puget Sound, at Butte, Mont.

L. M. Shipley, Superintendent of the Ft. Dodge division of the Chicago Great Western, has been appointed Superintendent of the Southwest division, with office at Des Moines, Iowa, succeeding C. S. Weston, resigned. A. E. Harvey succeeds Mr. Shipley.

Chester P. Wilson, Superintendent of the Lackawanna & Wyoming Valley, has resigned. W. E. Higgins has been appointed assistant to the General Manager, and J. H. Murray has been appointed Superintendent of Transportation. Heads of departments heretofore reporting to the Superintendent should hereafter report to the Vice-President and General Manager.

Alexander M. Keppel, a well-known signal engineer, and for two years (1899-1900) President of the Railway Signal Association, has been appointed Superintendent of the Washington Terminal Co., as has already been announced in these columns. Mr. Keppel was born January 6, 1865, at Edgewood Park, Pa. After attending the Pittsburgh public schools he went to Duff's Business College, and in 1882 began railway work as telegraph operator on the Pittsburgh division of the Pennsylvania. Two years later he became clerk in the Pittsburgh car shops, and in 1886 was made a clerk at the Pittsburgh transfer station. A few months later he was made telegraph operator in the Superintendent's office at Pittsburgh, and in September, 1887, was appointed manager of the Superintendent's telegraph office. By June, 1892, he had become Supervisor of Signals and Fire Marshal, and on January 1, 1902, was made Assistant Trainmaster in charge of passenger and freight business from Swissvale to Pittsburgh, including Brilliant branch. In 1906 he became Superintendent of the Potomac yard of the Washington Southern, and on January 1, 1909, was appointed Superintendent of the Washington Terminal Co.

Photograph by G. V. Buck.

A. M. Keppel.

The titles of T. J. Foley, Superintendent of Terminals of the Union Pacific and now Acting Assistant Superintendent of the Nebraska division, at Omaha, Neb.; George H. Likert, Master Mechanic, at Omaha; Augustus D. Schermerhorn, Division Engineer, at Omaha; William H. Putcamp, Assistant Division Engineer, at Omaha; J. Walter Adams, chief clerk to

the Superintendent and now Acting Superintendent of Terminals of the Nebraska division, at Omaha; James P. Carey, Trainmaster, at Omaha; Chauncey C. Cornell, Trainmaster, at Grand Island, Neb., and John L. Allavie, Traveling Engineer, at Omaha, have been discontinued and each given the title of Assistant Superintendent, with office at Omaha. The officers will continue to perform their present duties, and in addition will assume such other duties as may be assigned to them. An article in another part of this issue gives the reasons for this change.

Frank Ree, Chief Goods Manager of the London & North-Western Railway of England, has been appointed General Manager, succeeding Sir Frederick Harrison, retired. Mr. Ree was born in 1851, and began his railway career with Lebeau & Co., continental carriers. He later went into the service of the London & North-Western, and after a short time became a clerk in the continental office at Euston Station, London, England. In 1878 the London & North-Western took over the business of Chaplin & Horn, continental carriers, and Mr. Ree became assistant to the London Traffic Superintendent. In 1889 he became Manager of the Liverpool & Birkenhead district, and in June, 1893, was appointed Chief Goods Manager, succeeding Sir Frederick Harrison, who became General Manager.

Frank Ree.

Traffic Officers.

Harry P. Bronson, General Passenger Agent of the Trinity & Brazos Valley, has resigned.

M. Clarke has been appointed General Agent of the Tonopah & Goldfield, at San Francisco, Cal.

E. E. Carter has been appointed Division Freight Agent of the St. Louis & San Francisco, with office at Wichita, Kan.

A. B. Walmsley has been appointed Division Freight Agent of the Lehigh Valley at Newark, N. J., succeeding C. E. Crane, resigned.

G. M. Rowell has been appointed Traveling Freight Agent of the Chicago, Peoria & St. Louis, succeeding N. E. Mann, promoted.

Charles T. Mandel has been appointed Traveling Passenger Agent of the Carolina, Clinchfield & Ohio, with office at Johnson City, Tenn.

E. F. Blomeyer, General Agent of the Pere Marquette, at Milwaukee, Wis., has been appointed Assistant General Freight Agent, with office at Milwaukee.

R. M. Jenks has been appointed Commercial Agent of the Iowa Central and the Minneapolis & St. Louis, at Indianapolis, Ind., succeeding F. L. Townsend, promoted.

J. E. Graves, for eight years connected with the Freight Department of the Kansas City Southern, has been appointed General Agent of the El Paso & Southwestern, at Bisbee, Ariz.

E. B. Hooser, Division Freight Agent of the Chicago, Rock Island & Pacific and the St. Louis & San Francisco, at Wichita, Kan., will hereafter act for the Chicago, Rock Island & Pacific only.

Clarence M. Booth, Assistant General Freight Agent of the Pere Marquette, with office at Chicago, has been appointed First Assistant General Freight Agent, with office at Detroit, Mich.

J. H. Garrity, chief clerk in the freight department of the Buffalo, Rochester & Pittsburgh of Pittsburgh, has been appointed Soliciting Freight Agent at Pittsburgh, succeeding H. M. Lesher.

F. W. Birchnett, Jr., Traveling Freight Agent of the Chicago & Alton and the Toledo, St. Louis & Western, at New Orleans, La., has been appointed General Agent, Freight Department, at New Orleans.

C. D. Fortney has been appointed Traveling Freight Agent of the Chicago & Alton and the Toledo, St. Louis & Western, at Pittsburgh, Pa., succeeding W. E. Zirckel, resigned to go with another road.

H. H. Kilpatrick, Commercial Agent of the Clyde-Charleston Fast Freight Line at Macon, Ga., has been appointed Commercial Agent at Nashville, Tenn., succeeding A. S. McAlexander, resigned. W. E. Streyer succeeds Mr. Kilpatrick.

Samuel J. Cooke has been appointed General Agent, Freight Department, of the Chicago, Indianapolis & Louisville, at Chicago, succeeding M. Hunter, resigned to become General Manager of the California Butte Valley Land Co. at Macdoel, Cal.

E. F. Edgecomb has been appointed General Agent of the St. Louis & San Francisco, at Kansas City, Mo. Fred Smith, Commercial Agent of the Chicago, Rock Island & Pacific and the St. Louis & San Francisco, at Kansas City, Mo., will hereafter act for the Chicago, Rock Island & Pacific only.

John M. Gross, Freight Agent of the Eastern and Western Pennsylvania divisions of the Pennsylvania, has been appointed Division Freight Agent of the Philadelphia, Baltimore & Washington at Baltimore, succeeding G. H. Cobb, whose appointment on the Pennsylvania has been announced in these columns. William G. Spangle, Agent of the Pennsylvania at Milton, Pa., succeeds Mr. Gross.

Engineering and Rolling Stock Officers.

P. G. Burns has been appointed Chief Engineer of the Stamford & Northwestern, with office at Stamford, Tex.

L. W. Stubbs has been appointed Resident Engineer of the Houston & Texas Central, at Ennis, Tex., succeeding R. D. Parker, resigned.

W. A. Reid, Roadmaster of the Gulf, Colorado & Santa Fe, at Temple, Tex., has been transferred to Paul's Valley, Okla. M. Curran succeeds Mr. Reid.

W. C. Taylor, Assistant Chief Engineer of the Spokane, Portland & Seattle, has been appointed Engineer of Maintenance of Way of this road and of the Astoria & Columbia River, with office at Portland, Ore.

The office of Superintendent of Motive Power, Second division, of the Atlantic Coast Line, has been moved from Savannah, Ga., to Waycross. N. E. Sprowl, Master Mechanic at Savannah, has been appointed Shop Superintendent at Waycross, and W. J. Pamplin has been appointed Master Mechanic of the Savannah and Waycross districts, with office at Waycross, and jurisdiction over the forces at Savannah, Ga., Jesup, Brunswick, Thomasville, Albany and Waycross, including enginemen and firemen assigned to these districts.

Edgar B. Thompson, Assistant Superintendent Motive Power and Machinery of the Chicago & North Western, has been appointed Superintendent of Motive Power and Machinery of the Chicago, St. Paul, Minneapolis & Omaha, succeeding John J. Ellis, retired on account of having reached the age limit provided for in the pension system of the company. E. W. Pratt, Master Mechanic of the Lines West of the Missouri river, at Missouri Valley, Iowa, succeeds Mr. Thompson. S. C. Graham, Master Mechanic of the Ashland division, at Kaukauna, Wis., succeeds Mr. Pratt. William Hutchinson, Master Mechanic of the Iowa and Minnesota division, at Mason City, Iowa, succeeds Mr. Graham and F. C. Fosdick, Assistant Division Master Mechanic, at Chicago, succeeds Mr. Hutchinson.

Purchasing Officers.

H. B. Siebe has been appointed Storekeeper of the Trinity & Brazos Valley, with office at Teague, Tex., succeeding W. F. Duane, resigned.

OBITUARY.

W. C. Whitcome, Chief Despatcher of the Texas & Pacific at Fort Worth, Tex., died from rheumatism of the heart at Marshall, Tex., on January 6.

Donald Morrison, for a number of years President and General Manager of the Chicago & West Michigan, now a part of the Pere Marquette, died at New Orleans, La., on January 14.

Thomas D. Healy, an attorney for the Illinois Central, and formerly a United States Senator from Iowa, died of pneumonia at Ft. Dodge, Iowa, on January 15.

George L. Douglass, Vice-President and General Manager of the Western Transit Co., died on January 15 at his home in Buffalo, N. Y. He entered the employ of the Western Transit Co. as a clerk at Troy, N. Y., and in 1865 became Agent at Troy. He held this position for 15 years, during part of which time he was also Agent for the Blue Line. In 1881 he was appointed General Freight Agent of the Western Transit Co., and in January, 1897, was elected Vice-President and General Manager.

Henry Prosper Booth, for many years a shipping merchant in New York, died on January 16 at his home. He was born in New York in 1836; was educated at the Mechanics' Institute. He was president and a director of James E. Ward & Co., shipping agents, and of the New York & Cuba Mail Steamship Co., known as the Ward Line; also vice-president and a director of the International Coal Co. and the Commercial Investing Co. of Porto Rico, and a director of the American Mail Steamship Co., Federal Insurance Co., International Express Co., New Niquero Sugar Co., New York & Porto Rico Steamship Co., and United States & Porto Rico Navigation Co.

Railroad Construction.

New Incorporations, Surveys, Etc.

Abbeville & Northwestern.—This company expects to have its charter renewed soon. Surveys made for a line from Abbeville, Ga., northwest via Pine View, Unadilla and Emerich to Fort Valley, 58 miles, with a branch from Emerich west to Montezuma, 17 miles. J. L. Bankston, President, Abbeville.

Abilene & Southern.—This company, organized by the Colorado & Southern interests, recently filed its charter in Texas. The plans call for a line to be built from Abilene, Tex., south to Sonora, about 160 miles, with a branch from the main line near Ballinger southwest to San Angelo, 40 miles. Morgan Jones, President of the Wichita Valley, of Seymour, Tex., is at the head of the company. (Nov. 13, p. 1375.)

Acme, Red River & Northern.—This company, operating a line from Acme, Tex., east, via Quanah for 9.43 miles, will build a 45-mile extension this year, it is said, from Acme west into Cottle county.

Beaver, Penrose & Northern.—Incorporated in Colorado to build a railway from Beaver, Colo., 22 miles west of Pueblo, northwest to Penrose. The incorporators include C. M. MacNeill and Spencer Penrose, of Colorado Springs, and J. Q. McDonald, of Florence.

Canadian Northern.—An officer is quoted as having said that this company will make arrangements at once for building a line from Port Arthur, Ont., west to Parry Sound. (July 17, p. 554.)

Canadian Pacific.—Reports from Winnipeg, Can., indicate that this company is having surveys made for another line around Lake Superior from Port Arthur, Ont., east to North Bay.

Charleston & Western Carolina.—Work is to be carried out by this company's men, it is said, rebuilding yard tracks along the Savannah river at Augusta, Ga., which were carried away by high water. The improvements will include a total of 6,000 ft. of trestle work.

Chicago, Milwaukee & Puget Sound.—Track is laid from Maplevalley, Wash., to Seattle and Tacoma and is now being ballasted. From Maplevalley east there is about 18 miles of track to be laid. From Maplevalley to Johnson creek tunnel, east of Ellensburg, track is laid and almost ballasted. Johnson creek tunnel, 1,985 ft. long, will be completed about March 1. Track will then be laid to the Columbia river, about 24 miles, and the Columbia river bridge will be completed soon. Track is laid and partly ballasted from the Columbia river to the west end of the St. Paul Pass tunnel in the Bitter Root mountains, which latter will be completed in April. Track is laid from the east portal of the tunnel to Missoula. Track laying between Missoula and Garrison will begin about February 1. Track is laid and ballasted from Garrison, Wash., to Durant. Mixed trains are now being run for the transportation of material, passengers and commercial freight business between Beverly, Wash., and Rosalia. This train service will be extended through to St. Joe within 30 days. This will be all the train service provided until some time in the early summer, when probably local passenger trains will be put on first between St. Joe and Seattle and between Butte and Missoula. The entire line will be ready for freight traffic July 1. No through passenger trains will be run for a year after that date.

Chicago, Milwaukee & St. Paul.—See Chicago, Milwaukee & Puget Sound.

Eastland, Rising Star & Southern.—W. R. Coon, of Detroit, Mich., associated with capitalists of that city, is said to have made arrangements to build a line from Eastland, Tex., south to Rising Star, about 30 miles. Surveys made and work will be begun about April 1.

El Paso & Kansas City Short Line.—An officer writes that the route of this proposed line is from the southern boundary of New Mexico at the Texas state line east under the Guadalupe mountains along the Pecos valley, crossing the Pecos river at Malaga, thence northeast into the Panhandle of Texas. As surveyed the line in Texas will pass through the counties of Yoakum, Gaines, Terry, Lynn, Lubbock, Crosby, Floyd, Motley, Cottle and Hardeman to Quanah, where connection is to be made with the St. Louis & San Francisco. Bonuses have been granted amounting to $797,000 and right of way secured for about 480 miles. Col. J. L. Bell, of El Paso, Tex., and 25 Broad street, New York, is the principal promoter. (July 10, p. 505.)

Grand Trunk Pacific.—An officer is quoted as having said that construction will be started this year on the branch lines from Brandon, Man., east to Regina, Sask.; from Regina, northeast to Yorkton; from Biggar, Sask., north to Battleford, and from Wainwright, Alb., south, via Calgary, to the international boundary.

Great Northern.—An officer writes regarding reports that a large amount of money is to be spent for improvements in and about Great Falls, Mont., that nothing definite has as yet been decided upon. It is said that the improvements will include the enlargement of the yards at Great Falls and the construction of a new line from Great Falls east to Belt, to be used in conjunction with the Billings & Northern.

See Midland of Manitoba.

Gulf, Texas & Western Railroad.—See Gulf, Texas & Western Railway.

Gulf, Texas & Western Railway.—The Gulf, Texas & Western Railroad Co. has been incorporated in New Jersey, with a capital of $12,500,000, by Joseph J. Jermyn and George B. Jermyn, of Scranton, Pa., and Samuel S. Moore as a holding company for the Gulf, Texas & Western Railway Co. of Texas, which was incorporated in November to operate a line from Burrs Ferry, on the Sabine river, in eastern Texas, to the town of Benjamin, about 500 miles. The company owns coal lands in Jack and Young counties, Texas, which would be opened by the railway. West of Dallas the company has an old right of way for 250 miles, of which 60 miles is graded. Construction work is under way from Jacksboro west to the company's mines about 20 miles, and it is expected that coal will be hauled over this section of the line within six months. All the money necessary to carry out the work has been furnished, it is said, by the parties interested in the project. The officers of the operating company, which has a nominal capital of $500,000, are

R. C. Megargel, President, of Megargel & Co., No. 5 Nassau street, New York; Ben B. Cain, Tyler, Tex., Vice-President; W. F. Knox, Treasurer, and J. W. Pinson, Secretary, all of Texas. (Jan. 8, p. 89.)

LOUISVILLE & NASHVILLE.—The new branch of the Cumberland Valley division from Orby, Ky., southward to Chenoa, 12 miles, and a new branch of the same division from Pennington, Va., to Pocket, two miles, has been opened for business.

MIDLAND OF MANITOBA.—A report from Winnipeg, Can., indicates that both the Great Northern and the Northern Pacific will operate in Manitoba under the charter of the Midland of Manitoba, and that the company has applied for permission to build from Portage la Prairie, Man., west to Elkhorn, near the Saskatchewan boundary.

MOUNTAIN VALLEY & PLAIN.—This company is said to have made final arrangements to build a section of about 170 miles of railway through the Panhandle of Texas. The company was organized with a capital of $1,000,000 to build from Cimarron, N. Mex., east through Texas to Oklahoma City, Okla., 400 miles, and filed its charter recently in Texas. D. W. Herrington, of Dalhart, Tex., is interested. (Jan. 8, p. 89.)

NEW YORK CITY SUBWAY.—The Appellate division of the Supreme Court granted recently the application of the Public Service Commission for an extension of time until October 15, 1911, to begin work on the Broadway-Lexington avenue subway. The previous ruling made it necessary to begin work before January 25 to make valid the consent for the construction of the subway. The proposed route is from the Battery at the southern end of Manhattan Island, north through Greenwich and Vesey streets and Broadway to Ninth street, thence under private property and streets to Irving place, following that street and Lexington avenue to the Harlem river to 138th street, where it divides into two branches; one going north through Mott, River and Jerome avenues and the other northeast through 138th street, Southern Boulevard and Westchester avenue to Pelham Bay Park.

NORTHERN PACIFIC.—See Midland of Manitoba.

OHIO NORTHERN & MICHIGAN (ELECTRIC).—An officer writes that this company proposes to build lines as follows: Toledo and Ann Arbor branch, to run north connecting Lambertville, Mich., Petersburg, Dundee, Milan and Ann Arbor; extension from Petersburg northwest to Jackson via Britton, Ridgeway, Tecumseh, Brooklyn and the chain of lakes south of Jackson. The company has working connections with the electric lines at Jackson, Ann Arbor and Toledo. Track has been laid from Toledo, Ohio, north to Petersburg, and trains are now in operation on this part of the line, and grading has been finished from Petersburg to Ann Arbor. The company expects to build the section from Petersburg to Jackson as soon as the weather permits. A number of bridges are yet to be put in place, including one 125-ft. bridge, one of 100 ft., one of 80 ft. and three of 54 ft. The company is only capitalized for $1,000,000 and not for $17,000,000 as reported, and is not offering stock for sale. W. E. Niles, Secretary, 122 Monroe street, Chicago, Ill.

PENNSYLVANIA ROADS.—John H. Burns, of Pittsburgh, Pa., associated with capitalists of that place, is reported to have organized a company to build an electric line from Altoona, Pa., south to Bedford, about 40 miles. Rights of way secured, and work on the line is to be started in March.

PRESCOTT, READER & FORDYCE.—An officer writes that surveys are being made by this company, which now operates a line from Reader, Ark., on the St. L., I. M. & S., west to Lyda, six miles, to continue the line further west to another line of the St. L., I. M. & S., at Prescott, 24 miles from Reader. The company last year built one mile of this extension.

QUEENSTOWN COMPANY.—Reports from Birmingham, Ala., indicate that this company intends to build a belt line connecting the new town of Queenstown, Ala., on the main line of the Seaboard Air Line, about 12 miles east of Birmingham, with the Mineral Branch of the Louisville & Nashville. At Trussville, Ala., connection will be made with the Alabama Great Southern and at Leeds, Ala., with the Central of Georgia and the Southern. It is also understood that N. F. Thompson, Vice-President and General Manager, 2113 First avenue, Birmingham, Ala., is receiving bids for this work.

ROYALTON & ELIZABETHTOWN STREET RAILWAY.—This company, which has headquarters in Philadelphia, Pa., will begin construction this spring, it is said, on a line from Middletown, Pa., southeast via Royalton, Elizabethtown and Florin to Mount Joy. A branch is also to be built north to Lebanon, a total of 40 miles. The plans of the company include new shops, to be put up at Elizabethtown.

SASKATCHEWAN CENTRAL.—Balfour, Martin & Casey, Regina, Sask., are said to be attorneys for this company, which is seeking a charter to build five branch lines of railway in the province of Saskatchewan. The total length of these lines is said to be about 1,000 miles.

TEXAS ROADS (ELECTRIC).—Work is to be started in March, it is said, on an electric line to be built from Palestine, Tex., northwest via Corsicana to Waxahachie, thence north to Dallas, 117 miles, with a branch from Waxahachie east to Ennis, 10 miles. J. B. Watkins and G. A. Dureen, both of Corsicana, are interested.

Railroad Financial News.

BOSTON & MAINE.—Wm. A. Read & Co., New York, are offering the unsold portion of $11,700,000 4½ per cent. bonds of 1909-1929 at 105½, yielding 4.10 per cent.

CHESAPEAKE & OHIO.—In a circular announcing the meeting of stockholders for February 9 to act on the proposed issue of $30,000,000 bonds, G. W. Stevens, President, says that the result of the success of the plan to issue bonds will mean that "the company will be able to distribute to stockholders a more satisfactory share of its future surplus earnings."

This company has bought from Potter, Choate & Prentice and Clark, Dodge & Co., both of New York, all the preferred and common stock of the Virginia Air Line. The road of the Virginia Air Line forms a connecting link between the James River division and the Richmond & Allegheny division of the Chesapeake & Ohio, and is about 30 miles long.

CHICAGO & NORTH WESTERN.—Kuhn, Loeb & Co., New York, have bought $10,000,000 general mortgage 3½ per cent. bonds of 1897-1987, and the Chicago & North Western has sold in addition, to the same bankers, $3,750,000 first mortgage 3½ per cent. bonds of the Manitowac, Green Bay & Northwestern, and $2,500,000 first mortgage 3½ per cent. bonds of the Milwaukee & State Line Railroad. Principal and interest on these additional bonds are unconditionally guaranteed by the Chicago & North Western.

CHICAGO, BURLINGTON & QUINCY.—Bonds to bear 4 per cent. interest and amounting to $20,000,000 are to be sold shortly through J. P. Morgan & Co., New York, the proceeds of the sale to be used to finance the purchase by the Burlington of the Colorado & Southern.

GEORGIA RAILWAY & ELECTRIC.—Stockholders are to vote January 26 on a proposal to make a new blanket mortgage securing $20,000,000 bonds, of which $11,000,000 are to be reserved to retire underlying bonds and $9,000,000 to be issued from time to time for extensions and additions.

NEW YORK CENTRAL & HUDSON RIVER.—The directors have formally designated J. P. Morgan & Co., New York, who have been the company's bankers in the past, as its bankers. This is apparently an answer to the rumors that if E. H. Harriman were elected to the board of directors the company's bankers might be changed.

TARRYTOWN, WHITE PLAINS & MAMARONECK.—J. Addison Young, temporary receiver, has been appointed permanent receiver. (Jan. 1, p. 37.)

TEXAS MIDLAND.—The application made to the Texas Railroad Commission to issue $2,000,000 4½ per cent. bonds has been amended, making the rate 4 per cent., and the amended application has been granted by the commission. The road runs from Paris, Tex., to Ennis, 124 miles.

TOLEDO RAILWAYS & LIGHT.—Albian E. Land, who, in Novem-

ber, 1902, resigned as president in favor of Henry A. Everett, has again been re-elected president.

The committee, representing $4,400,000 of the outstanding $4,800,000 first mortgage 4 per cent. bonds, interest on which has been in default since July 1, 1908, has provided about $150,000 required to meet the January interest on underlying bonds.

Virginia Air Line.—See Chesapeake & Ohio.

Wisconsin Central.—A majority of the stock was transferred to Newman Erb at the directors' meeting held January 20. This is in accordance with the plan of the Minneapolis, St. Paul & Sault Ste. Marie to take over control. (See page 168 of this issue.) It is said that William A. Bradford, President, W. A. Chadbourne, Jr., Chairman of the Board of Directors and General Counsel, and F. T. Gates and George J. Gould, Directors, are to retire soon.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Iowa Central is said to be in the market for from 15 to 30 locomotives.

The Minneapolis & St. Louis will later be in the market for from 10 to 14 locomotives.

The Great Northern has ordered 20 locomotives from the Baldwin Locomotive Works.

The Minneapolis, St. Paul & Sault Ste. Marie is asking prices on eight locomotives.

The Florida Land Co. has ordered one locomotive from the Baldwin Locomotive Works.

Arnhold, Karberg & Co. have ordered two locomotives from the Baldwin Locomotive Works.

The Sorocabana Railway has ordered four locomotives from the Baldwin Locomotive Works.

The Mahoning Ore & Steel Co. has ordered one locomotive from the American Locomotive Co.

The Latrobe-Connellsville Co. has ordered one locomotive from the Baldwin Locomotive Works.

The Wichita Falls & Southern has ordered one locomotive from the Baldwin Locomotive Works.

The Atlanta & St. Andrews Bay has ordered one locomotive from the Baldwin Locomotive Works.

The Escanaba & Lake Superior has ordered one 10-wheel locomotive from the Baldwin Locomotive Works.

Winston & Co. have ordered three locomotives from the Richmond works of the American Locomotive Co.

The Ohio & Michigan Southern, Chicago, expects to be in the market for electric motive power about March 1.

The Lake Shore & Michigan Southern is said to be in the market for a number of locomotives. This item is not confirmed.

The Carnegie Steel Co., Pittsburgh, Pa., has ordered five locomotives from the Pittsburgh works of the American Locomotive Co.

The Grand Trunk is said to have ordered 25 locomotives from the Locomotive & Machine Co. of Montreal. This item is not yet confirmed.

The Canadian Pacific is said to have ordered 30 locomotives from the Locomotive & Machine Co., of Montreal. This item is not yet confirmed.

The Oliver Iron Mining Co. (U. S. Steel Corporation) has ordered 13 locomotives from the Pittsburgh works of the American Locomotive Co.

The Michigan Central is contemplating the purchase of new locomotive equipment, but we are advised that no definite arrangement has been decided upon.

The Central of Brazil, reported in the *Railroad Age Gazette* of January 15 as having ordered nine locomotives from the Baldwin Locomotive Works, has increased this order to 15 locomotives.

The Maine Central, as reported in the *Railroad Age Gazette* of January 8, has ordered three Pacific and two 8-wheel simple passenger locomotives from the American Locomotive Co., for delivery in April, 1909.

General Dimensions.

	Pacific.	Eight-wheel.
Weight on drivers ...	138,000 lbs.	82,000 lbs.
Weight, total	214,000 "	126,000 "
Cylinders	22 in. x 28 in.	18 in. x 24 in.
Diameter of drivers..	73 in.	69 in.
Boiler, type	Wide, radial.	Wgn. top, radial.
" wkg. stm. pres.	200 lbs.	190 lbs.
Heating surface:		
Tubes	3,259 sq. ft.	1,614 sq. ft.
Firebox	186 "	138 "
Total	3,445 "	1,752 "
Tubes, number	285	267
" outside diam...	2¼ in.	2 in.
" length	19 ft. 6 in.	11 ft. 7½ in.
Firebox, type	Wide.	Shallow.
" length	96 in.	90 in.
" width	75 "	41½"
" material	Steel.	Steel.
Grate area	50 sq. ft.	26 sq. ft.
Water capacity	6,500 gals.	5,000 gals.
Coal capacity	12 tons.	9 tons.
Tractive effort	31,600 lbs.	19,200 lbs.

Special Equipment.

Axles	Steel.	Steel.
Boiler lagging	Magnesia.	Magnesia.
Brakes	Westinghouse.	Westinghouse.
Headlight	Electric.	Oil.
Valve gear	Walschaerts.	Stephenson.
Wheel centers.	Cast steel.	Cast steel.

CAR BUILDING.

The Ohio & Michigan Southern, Chicago, expects to be in the market for electric cars about March 1.

The East Indian Railway received bids until January 13 on a number of coal and box cars and cabooses.

The Newburgh & South Shore is said to be in the market for 200 ore cars. This item is not yet confirmed.

The Chesapeake & Ohio has ordered three dining cars from the Pullman Company and 500 fifty-ton freight cars from the Standard Steel Car Co.

Morris & Co., Chicago, have ordered 53 forty-ton, 8,000-gal., steel tank cars from the Chicago Steel Car Co., First National Bank building, Chicago.

The Seaboard Air Line is said to have ordered from the Barney & Smith Car Co. the 15 passenger cars mentioned in the *Railroad Age Gazette* of December 18. This item is not yet confirmed.

The Omaha & Council Bluffs Street Railway, Omaha, Neb., at its annual meeting of stockholders, announced that specifications are being prepared for 25 large cars, a portion of which will be built in its own shops.

The Aurora, Elgin & Chicago, as reported in the *Railroad Age Gazette* of June 5, is having 25 trucks built by the Pullman Co. These will be delivered about February 1. The center plates for these equipments will be of the ball-bearing type, made by the T. H. Symington Co.

The Seaboard Air Line is said to have ordered 500 thirty-ton steel underframe box cars from the South Baltimore Steel Car & Foundry Co.; 200 fifty-ton steel phosphate cars from the Barney & Smith Car Co., and 50 fifty-ton ballast cars from the Rodger Ballast Car Co. This item is not yet confirmed. The equipment was mentioned in the *Railroad Age Gazette* of December 4.

IRON AND STEEL.

The Great Northern is said to be in the market for 8,000 tons of rails.

The Boston & Maine is said to be in the market for about 8,000 tons of rails.

The New York, New Haven & Hartford is said to be preparing specifications for 25,000 tons of rails.

The Louisville & Nashville is said to be in the market for from 50,000 to 65,000 tons of open hearth rails.

The Bettendorf Axle Co., Davenport, Iowa, is in the market for 1,300 tons of structural steel for use in building a new foundry.

The Michigan Central will ask prices soon on steel work for a new bridge at Joliet, Ill. (See Joliet, under Railroad Structures.)

The Royal Siamese State Railways, L. Weiler, Director General, Bangkok, will receive bids until April 15 on 20,000 tons of rails.

The Cincinnati, New Orleans & Texas Pacific is in the market for 3,000 tons of structural steel for a new bridge across the Kentucky river.

The New York Central Lines are believed to be about to place orders for 1909 rail requirements. The tonnage will probably be about 80,000 tons.

The International & Great Northern, reported in the *Railroad Age Gazette* of January 8 as requiring 85-lb. rails to equip about 165 miles of road, is said to be in the market for 22,000 tons.

The Chicago, Milwaukee & St. Paul, reported in the *Railroad Age Gazette* of January 15 as being in the market for 500 tons of structural steel, has ordered 483 tons from the Wisconsin Bridge Co.

The Pittsburgh & Lake Erie, reported in the *Railroad Age Gazette* of January 1 as soon to place a contract for 10,000 tons of rails for delivery early in 1909, is said to be in the market for 9,000 tons.

The Crane Co., Chicago, is in the market for 500 tons of structural steel for a new warehouse at San Francisco, Cal. Prices have been asked, but no contract yet awarded, for 2,500 tons of structural steel for this company's proposed warehouse at Chicago.

The South Australia Government Railways, through the Supply and Tender Board Office, Adelaide, is asking bids on 4,200 tons of 80-lb. rails and 286 tons of steel fishplates; 1,500 tons of 60-lb. rails and 100 tons of fishplates for same, and 1,900 tons of 50-lb. rails and 120 tons of steel fishplates.

RAILROAD STRUCTURES.

AUGUSTA, GA.—See Charleston & Western Carolina under Railroad Construction.

BRISTOL, N. B.—Local reports say that the Canadian Pacific will rebuild its passenger station at an estimated cost of $3,000.

BURLINGTON, WASH.—The Great Northern has prepared plans for additional improvements to cost $50,000, including the building of a new station, four miles of additional sidings, two water tanks and a coal chute. The new station will be 40 ft. x 100 ft., with a 600-ft. platform.

CALGARY, ALBERTA, CAN.—The Grand Trunk Pacific and the Canadian Northern are negotiating with the Dominion Government for the purchase of a tract of land at the foot of Eighth avenue, as a site for a union passenger station. It is expected that the depot will be erected this year. The extensions of the Canadian Northern from Saskatoon, Sask., and Vegreville, Alb., and of the Grand Trunk Pacific from Hardisty, Alb., will probably be built into Calgary this year.

According to a despatch credited to General Manager Bury, of the Canadian Pacific, new shops will be built at Calgary within the year. They will be designed to employ about 1,500 men and will be about the same size as the present shops at Winnipeg, Man.

ERWIN, TENN.—The initial capacity of the shops of the Carolina, Clinchfield & Ohio will be 100 locomotives, but all construction and building is being done with a view to increasing the capacity to 500 locomotives. (Jan. 1, p. 38.)

HATTIESBURG, MISS.—The New Orleans & Northeastern received bids until January 18 for the erection of a new passenger station, boiler house, express room and cement platforms. The station is to be 36 ft. x 215 ft. and of brick and stone. The express room will be 36 ft. x 75 ft. The cost of these improvements is estimated at $50,000. (July 24, p. 597.)

HAYDEN, COLO.—The Denver, Northwestern & Pacific has given the contract for building machine shops. Hayden is situated 23 miles west of Steamboat Springs, Colo., the present terminus of the road.

JERSEY CITY, N. J.—A new building for the use of the Pennsylvania Railroad Y. M. C. A., to cost about $15,000, is to be built at Montgomery and Green streets.

JOLIET, ILL.—The contract for concrete work for a bridge to be built jointly by the Michigan Central and the Chicago, Rock Island & Pacific, has been given to the Keltie Construction Co., Joliet. Bids for the steel work will be asked by the Chief Engineer of the Michigan Central.

ST. LOUIS, MO.—The St. Louis Transfer Co. is preparing plans for a one-story freight depot, 400 ft. x 125 ft. It will cost $40,000.

TACOMA, WASH.—Press reports say that the City Council of Tacoma, Wash., has passed an ordinance granting vacations of city lands asked for, and giving the Great Northern a franchise to cross Twenty-first street and River street with freight tracks. An officer of the company is quoted as saying that work will be started on the terminal buildings and tracks at once. Final surveys are being made for the track work and plans for the freight sheds, a roundhouse and other terminal buildings are made. As soon as contracts can be let and the material assembled, work is to be started. (Dec. 18, p. 1612.)

TEMPLE, TEX.—The Gulf, Colorado & Santa Fe has given the contract for a part of its improvements at this point to J. C. Scott, Sons & Co., St. Louis, Mo. (Dec. 25, p. 1666.)

TORONTO, ONT.—The order of the Railway Commission in connection with the projected viaduct is said to provide for a structure from York to Cherry streets, or from the Union station to the east end of the city, with overhead bridges in the western portion of the water front; also that the city will bear one-third of the cost of construction and the railways two-thirds. (R. R. G., Feb. 7, p. 199.)

Ties Bought in 1907.

The total purchases of ties in 1907 exceeded those of 1906 by 50,865,578, or nearly 50 per cent. The increase in hewed ties was 40,889,543, or 52.8 per cent., while the increase in sawed ties amounted to 9,976,035, or 39.4 per cent. Hewed ties formed 77 per cent. of the total in 1907.

In 1907 about 23,557,000 ties were reported as purchased for new tracks. This item includes spurs, switches and sidings, as well as actual extensions of roads. Nearly 19,722,000 ties were used for this purpose by steam roads, amounting to 13.7 per cent. of the total purchases by these roads. The balance, or over 3,835,000 ties, or nearly 40 per cent. of the total number of ties purchased by electric railways, were for new tracks.—*Forest Products Bulletin.*

Reservoir Dam Contract.

The MacArthur Brothers Co., New York, has been given a contract by the Eastern Colorado Power Co. for building the Barker reservoir dam near Boulder, Colo. The dam is to be of cyclopean concrete masonry, resting on a solid rock bottom and sides. It is on Middle Boulder creek at a point about 17 miles west of Boulder, and 1½ miles east of Nederland. The length of the dam at the surface of the creek is to be about 250 ft., the length of crest is to be about 625 ft., and the height above bed rock is about 180 ft. There will be about 140,000 cu. yds. of cyclopean masonry.

The power company has done considerable preliminary work and has built a railway about 2½ miles long from a siding on the Chicago & North Western up to the dam site. The contractors expect to begin work about February 1 and will finish it before January 1, 1910.

This company built the Wachusett dam (Boston water supply) and the Cross river dam (New York water supply).

It also has the contract for the main dam of the Ashokan reservoir for the new Catskill water supply of New York.

Groton Shipyard Sold.

The plant of the Eastern Ship Building Co. at Groton, Conn., opposite New London, has been sold in separate lots to various buyers. It was at this plant that the steamships Minnesota and Dakota were built.

Supply Trade News.

F. E. Place, General Superintendent of the Buda Foundry & Manufacturing Co., Chicago, has been appointed General Manager, with jurisdiction over the selling and manufacturing departments.

The Northwestern Railway Supply Co., Chicago, has been incorporated to manufacture and sell railway supplies and equipment. The incorporators are: William S. Barbee, Thomas A. Barbee and C. R. Murray.

The Metallic Railroad Tie Co., Shirley, Ind., has been incorporated to manufacture and sell metallic railway ties. Capital stock, $10,000. The incorporators include: George Williams, Frank Gordon, James McCune and others.

The Bureau of Manufactures, Washington, D. C., has a communication (inquiry No. 2992) from a city in Latin-America to the effect that a horse car line there is to be electrified. The name of the general manager is on file at the Bureau of Manufactures.

Bids will be received until February 1 by the Isthmian Canal Commission on electric motors, refrigerators, hose, packing, belting, manila rope, cotton waste, valves, flue cleaners, chain blocks, tackle blocks, rivets, nuts, nails, wire netting, wrenches, hammers and other tools and supplies. (Circular No. 488.)

The Gisholt Machine Co., Madison, Wis., has opened an office and display rooms at Washington Boulevard and Desplaines street, Chicago, in charge of Charles Spalding. A full line of Gisholt machines will be carried in stock and the different types of the machines will be arranged so that a practical demonstration of their operation may be seen.

The Interstate Cement Tile Manufacturers' Association will hold its third annual convention at the Armory, Minneapolis, Minn., on March 2. This meeting will be in conjunction with the annual meeting of the Northwestern Cement Products Association. The Interstate Cement Tile Manufacturers' Association represents an invested capital of over $1,000,000 and is represented in eight states.

Robert Mather, President of the Rock Island Company, the holding company for the Rock Island and Frisco lines, has been elected Chairman of the Board of the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., succeeding E. C. Converse, who has been temporary Chairman since the reorganization. Charles A. Terry, Secretary and Attorney of the company, has been elected a Vice-President. He will remain Attorney, but will continue as Secretary only until the directors can choose a successor.

J. M. Duntley, President of the Chicago Pneumatic Tool Co., Chicago, will retire from that position at the time of the next annual meeting, February 15, and his brother, W. O. Duntley, will succeed him. J. M. Duntley will become President of the Duntley Manufacturing Co., recently organized, and will also give his attention to the foreign business of the Chicago Pneumatic Tool Co., with a view to reorganizing and expanding that department. Another change to be made at the annual meeting of the Chicago Pneumatic Tool Co. is the election of John R. McGinley, of Pittsburgh, Pa., as Chairman of the Board, succeeding Charles M. Schwab.

The Carborundum Company, Niagara Falls, N. Y., is to increase its plant by the addition of a four-story brick and steel structure, 225 ft. x 60 ft. One entire floor is to be given over to the manufacture of carborundum sharpening stones, hones, scythe stones and other specialties. The other floors will be used for the mixing and wheel molding departments and for storage room. During the past year the company has added several new lines to its manufactured products. These include garnet paper and cloth, used in the wood and furniture trade, and emery paper and cloth, used in finishing metal and machinery parts. The addition of these lines and the development of the regular sharpening stone and grinding wheel business has made the addition to the plant necessary. The company expects later to make abrasives for every use.

The Independent Pneumatic Tool Co., Chicago, at its annual meeting of stockholders held at Jersey City, N. J., elected the following directors: James B. Brady, W. O. Jacquette, John P. Hopkins, James J. McCarthy, M. S. Rosenwald, S. Florsheim, John M. Glenn, John D. Hurley and John R. Turner. At the annual meeting of the directors held in Chicago, the following officers were elected: President, James B. Brady; First Vice-President, W. O. Jacquette; Second Vice-President, John D. Hurley; Secretary and Treasurer, A. B. Holmes. The annual report shows that the company is in good financial condition, and that during the quarter ending December 31, 1908, 40 per cent. more business was transacted than during the corresponding period of 1907. The company has enough orders booked to keep its plant at Aurora, Ill., running full capacity for several months, and its export as well as its domestic business is gradually improving.

The American Blower Co., Detroit, Mich., has consolidated with the Sirocco Engineering Co., New York. S. C. Davidson, of the Sirocco Engineering Co., Belfast, Ireland, the parent company, is financially interested in the consolidation. The factory of the Sirocco company at Troy, N. Y., and the plants of the American Blower Co. will continue in full operation under one management, the general offices being at Detroit. All business of the consolidated companies will hereafter be transacted under the name American Blower Co. James Inglis remains President of the American Blower Co.; William C. Redfield, President of the Sirocco company, becomes Vice-President of the American Blower Co.; Charles H. Gifford, the Treasurer, was until about a year ago General Manager of the B. F. Sturtevant Co., Hyde Park, Mass.; Mr. Still, the Secretary, is Chief Engineer of the American Blower Co. The Sirocco centrifugal fan was invented about 1897 by Mr. Davidson. It was patented in England in 1898; in the United States in 1900, and in 1903 was put on the American market by the New York company. Infringement suits now pending will be continued.

Walter H. Cottingham was elected President of the Sherwin-Williams Co., Cleveland, Ohio, at the recent meeting of the Board of Directors, succeeding H. A. Sherwin. Mr. Sherwin remains with the company as Chairman of the Board. S. P. Fenn was elected Vice-President and Treasurer, and A. W. Frank, Assistant Treasurer and Secretary. Mr. Cottingham, whose portrait we reproduce herewith, is 43 years old and for over 20 years has been prominently associated with the Sherwin-Williams Co. For ten years he was connected in different capacities with the Canadian branch, and the details of the business he represented were then so thoroughly mastered and his ability to devise and successfully adopt new methods became so conspicuous that in December, 1898, he was appointed General Manager, with headquarters at Cleveland. After the death of E. P. Williams, Vice-President, Mr. Cottingham was elected Vice-President and General Manager. This office he held until his election as President. He is the author of a book for

W. H. Cottingham.

salesmen, the general distribution of which by many large manufacturing concerns to their employees sufficiently attests the theoretical as well as practical ability of its author Mr. Cottingham sailed for London on Wednesday last in the interest of the company.

W. H. Hooper, who for the past ten years has been with the Safety Car Heating & Lighting Co., New York, as General Agent at Chicago, has been appointed Assistant to the President of the Chicago Car Heating Co., Chicago. He was born in Wales on September 1, 1860. He was educated at the public schools at Grand Island, Neb., after which he entered the foundry and machine business at Grand Island, remaining in this work until 1890. In 1891 he was appointed Assistant Superintendent of the Freight Department of the St. Charles Car Co., St. Charles, Mo., now a part of the American Car & Foundry Co., New York. In 1892 he went to St. Louis, Mo., as Assistant Engineer of the Safety Car Heating & Lighting Co. From 1898 until his recent appointment he was the General Agent of the Safety Car Heating & Lighting Co., in charge of the Chicago office. Mr. Hooper will make his headquarters in the main offices of the company, Railway Exchange building, Chicago.

W. H. Hooper.

TRADE PUBLICATIONS.

Brake Beams.—The Buffalo Brake Beam Co., New York, has just issued a leaflet which is descriptive of brake beam forgings, including heads, fulcrums, chain clips, wheel guards and hangers.

Rail Joints.—The Rail Joint Co., New York, has just issued catalogue No. 3, which includes a number of full-page half-tone illustrations showing the various rail joints manufactured by this company; also a number of references to the advantages resulting in the use of these rail joints.

Pipe and Boiler Insulation.—The H. W. Johns-Manville Co., New York, has just issued Catalogue No. 100, which is devoted to a presentation of the problems of insulating all kinds of heated and cooled surfaces, such as pipes, boilers, furnaces, flues, ducts, etc., and for refrigerating and cold storage work.

Center Crank Engines.—The Ridgway Dynamo & Engine Co., Ridgway, Pa., has just issued Bulletin No. 19, which describes, with a number of half-tone and line cuts, the Ridgway single valve center crank engines. Two full-page tables cover the specifications of Ridgway simple and compound engines.

Blowers and Engines.—The American Blower Co., Detroit, Mich., has just issued a number of catalogues, including Circular No. 242, on A. B. C. electric forge blower; No. 244, on variable speed engines for driving paper making machines; No. 247, on Detroit steam traps, and No. 246, which contains a treatise on shop heating by F. R. Still, Vice-President and Chief Engineer of the American Blower Co.

Locomotive Finished Material.—A catalogue just issued by the Locomotive Finished Material Co., Atchison, Kan., describes a line of business which is new in connection with locomotive repair work, that of manufacturing and finishing locomotive parts for the market so that a railway may keep on hand and ready for use a stock of finished parts. Illustrations show interior views of the company's shops and also various locomotive parts which are manufactured.

Telephone Switchboard Installation.

The Western Electric Co., Chicago, recently made a rapid telephone switchboard installation at Franklin, Pa. The exchange was destroyed by fire on November 17. The Pittsburgh branch of the Western Electric Co. was telegraphed to while the fire was still burning, and emergency boards, which the company keeps on hand, at its branch offices, were set up in Franklin in about 48 hours. At about the same time, a carload of switchboard material was received at Franklin from the Western Electric plant at Hawthorne, Ill. The next morning the electrical company's men began installing this material, and on November 29, twelve days after the fire, the new switchboard was completed and in service.

Dallett Air Compressors.

A line of air compressors as built by Thos. H. Dallett & Co., Philadelphia, Pa., show many excellent and unique ideas in air compressor design. These compressors are designed so that all parts requiring adjustment or renewal are readily accessible and by using a liberal amount of metal, rigidity in operation is insured. The capacity of any compressor may be increased by replacing its air cylinder by that of the next larger size compressor.

The frame is of the open fork center crank type and especially massive in design. The duplex belt, duplex steam and single steam machines are supported on a deep rigid sub-base, thus making the entire machine self contained, which maintains perfect alinement and insures satisfactory operation on either a rough, temporary foundation of timbers or on a permanent concrete or brick foundation. An oil gutter is provided entirely around the lower base flange on all sub-bases. This is a particular feature as it insures a clean foundation and a floor free from oil or stains. The main bearings are lined with a high grade of babbit metal, which is poured into dove-tailed recesses and well piened in to prevent shrinkage. Lubrication is effected by sight-feed devices, gravity or a force feed system, drainage being provided for all drips from the guides, stuffing boxes and the crank pit.

The steam cylinder and valve gear of the steam-driven machines are well suited to the operation of compressors, giving high efficiency with little attention. All steam ports are short and direct. The clearance has been reduced to a minimum to provide appreciable saving in steam consumption. A plain D, balanced slide valve is used on the small and medium sized machines, while the Meyer balanced, adjustable, cut-off valve is used on the larger machines. To provide sufficient heat insulation, all steam cylinders are lagged with mineral wool and neatly jacketed. The rocker arms on all valve gears are adjustable to compensate for wear. On the steam-driven machines, the governor is equipped with a safety stop device which stops the machine on a breaking of the governor belt. The governor pulley is placed on the end of the shaft outside of the flywheel on the single machine, thus bringing the flywheel as close to the bearing as possible, and also preventing oil or grease, thrown by the eccentric, from getting on the governor belt. A reducing valve is used on the duplex compressors with compound steam cylinders, which reduces the live steam pressure for use in the low pressure cylinder. If the high pressure side stops on the dead center, live steam is fed to the low pressure cylinder through th reducing valve for starting the pressure. The live steam is taken into the low pressure side only when starting, otherwise the operation is identical with any compound machine.

The air and steam cylinders are tied together and held in position by an internally-flanged tie or distance piece. On the smaller sizes, this piece supports the air cylinders, but on the larger sizes, the air cylinder is supported on a pedestal, while the tie piece is of circular design without the foot piece. Ample openings are provided on each side of the tie piece to allow adjustment of the stuffing boxes and tightening the cylinder stud nuts. The air cylinders are of special hard, close-grained iron, and each is thoroughly tested under hydraulic pressure of 200 lbs. before assembling. The clearance space is reduced to a minimum and all heads and cylinder walls are thoroughly water-jacketed to obtain the highest possible efficiency. Means are provided for draining the water from the cylinder-head and cylinder jackets. Oil is fed directly into the intake passage and the suction carries it into the cylinder in the form of a fine spray. This method of lubrication has been thoroughly tried and is said to give efficient and equal lubrication to all working parts.

The cross head is a new type box pattern, made of semi-steel. The shoes are adjustable and have large bearing surfaces. The upper shoe is lubricated by a sight-feed lubricator and the lower one runs in oil. One of the features of this design is the side openings, which allow easy access to the binder nuts. The cross head pin, of hardened and ground tool steel, is fitted to taper seats in the cross head and secured by a nut. Wearing is compensated for by provision for turning the pin a one-quarter revolution. The intake valve, of the automatic poppet type, is contained in a malleable iron cage. The cage is one piece and combines both seat for the valve and guide for the valve stem. The cage is threaded and screws into the wall of the air intake chamber only and is simply seated in a recess on the main

cylinder wall using thin corrugated copper gaskets. A hexagonal recess is cast in the cage to accommodate a special wrench for use in removing and replacing the valve cages. The valve cage cap acts as a lock nut for holding the cage in place after it has been screwed down on its seat in the cylinder. In the case of a compound machine, corrugated copper gaskets are placed under the valve cage caps on the high pressure cylinder to prevent leakage, as the discharge pressure from the low pressure cylinder acts constantly at these joints. The valve proper is a special alloy hardened steel with seat and stem ground to gage. The phosphor bronze valve spring gives the valve an easy opening and a quick closing. Mechanically operated intake valves may be supplied on any size compressor. These valves are ground to gage and the valve holes lapped to size. All of the Dallett standard low pressure compressors are suitable for vacuum service and are furnished with mechanically-operated intake valves for high vacuum.

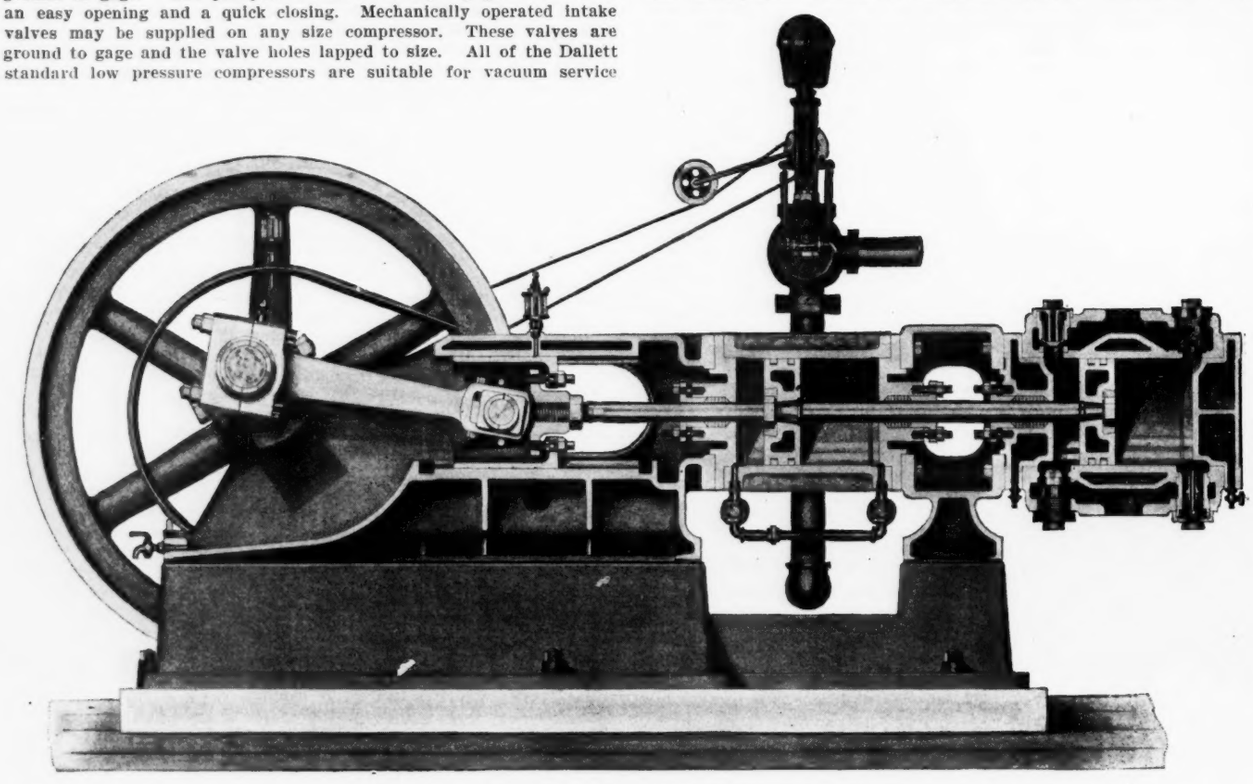
Much trouble is claimed to have been caused on certain makes of intake valves, due to the spring holder shearing off or breaking loose. The cause of this trouble is said to be due to the sudden stop of the valve on the seat, which tends to drive the spring holder off the valve stem. On the Dallett valve, the spring holder comprises a split taper ring set into a recess on the valve stem and held together tight to the stem by a taper ring which slips down over it. The hammering of the valve on a seat should tend to tighten the spring holder on the stem instead of driving it off.

Cross Head.

The alloy hardened steel discharge valve is of the automatic poppet type contained in a malleable iron valve cage. The method of seating in the cylinder and locking to its seat is the same as that of the intake valve. The boss on the valve cap acts as a positive stop for the valve when it has reached a lift of full opening, and is said to prevent fluttering. This boss also serves as a spring guide for the valve spring.

The connecting rod, of the marine type, is made of a crucible steel and both crank pin and cross head boxes are made of phosphor bronze. Adjustment is obtained at the cross head by wedge and split box. The crank pin end is adjustable and both bearing surfaces, of liberal proportions, are lubricated by wick wipers. The crank shaft on both single and duplex machines is massive and forged from a solid billet of mild open-hearth steel. On a duplex shaft, the portion in the center is enlarged to connect the heavy flywheel. The wheels on all machines are heavy and of large diameter for smooth operation, and in the case of belt machines, the face is very wide. The flywheels on all machines have square cored holes in the rim to facilitate turning over by hand.

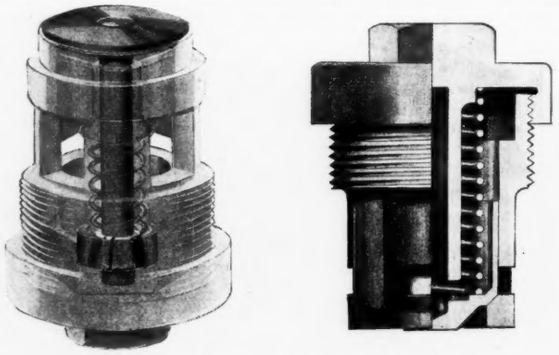
The Dallett inter-cooler has a large cooling area, employing the return flow type of water circulation, using baffle plates to deflect the flow of air and aid in its effectual contact with the cooling tubes. This method is said to be very efficient in reducing the temperature of air between the stages to approximately the original temperature, thus tending to reduce the final air discharge temperature and also the horse-power required for a given capacity. Unions have been



Sectional Elevation of Dallett Single Steam Machine.

supplied to permit the removal, intact, of the nest of cooling tubes, from the inter-cooler box, without discharging any of the piping. The inter-cooler is supplied with a pop safety valve, pressure gage and drain valve.

In a compressed air plant, the demand for air is often of such an intermittent character that automatic regulation of the supply of air becomes a necessity. The belt-driven machines are provided with an unloading device which automatically unloads the air cylinder. When a certain determined pressure is reached in the air receiver, one or more inlet valves at both ends of the air cylinder are held open and the load is taken off the compressor, allowing it to run light until the pressure drops in the receiver, when the valves are released and air compression is resumed. On the steam machines, a combined speed and pressure governor is used. This governor unloads the air cylinder exactly the same as on a belt-driven machine and at the same time it controls the speed, allowing a single steam machine to just turn over when unloaded and bringing a duplex or compound machine to a dead stop. By this means a great saving in steam is said to be



Dallett Intake and Discharge Valves.

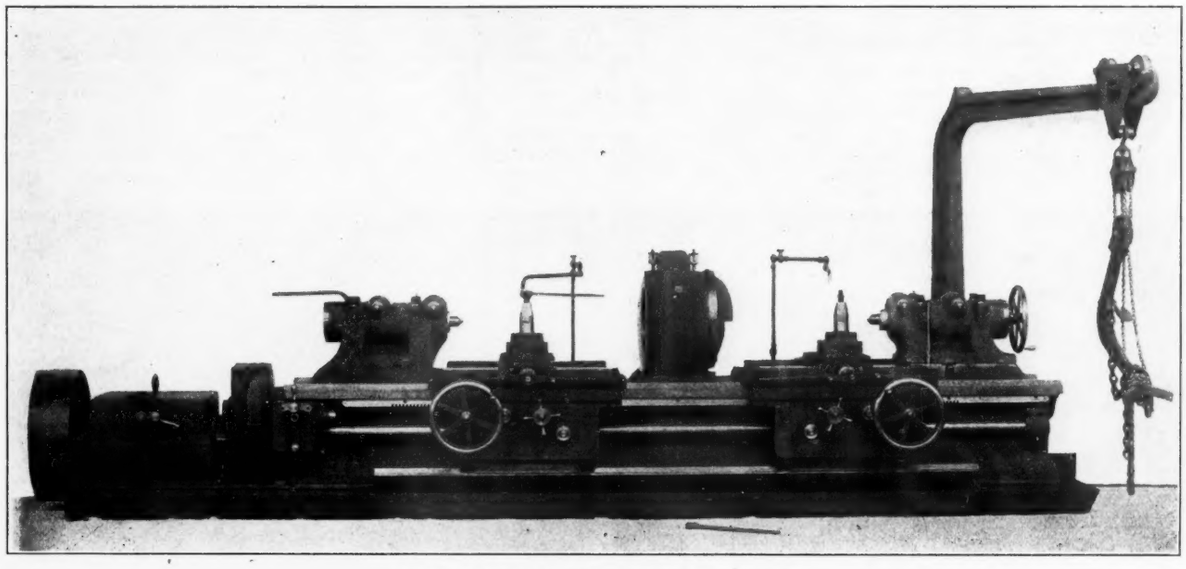
effected and the wear and tear on the working parts, as in the case of a continuous running machine, is reduced.

The compressors described are built in sizes from 8-in. stroke up to and including 16-in. stroke and give a range of capacity from 79 cu. ft. of free air per min., to 1,200 cu. ft.

Heavy Axle Lathe.

The accompanying illustrations show an extra heavy axle lathe of rigid construction, with a powerful drive and all the conveniences that the character of the work demands. Under ordinary conditions this lathe will finish 26 car axles in 10 hours. The bed is massive, the cross-girths being of box section. A longitudinal member, of box section, is cast in the center of the bed and extending its full length parallel to the outer walls, further stiffening the cross-girths. The walls of the bed are heavy and the metal dovetails on the upper and lower edges are as nearly equal as possible. The ends of the bed are cut away to facilitate the removal of the tailstock or to permit a reasonable overhang of the same when necessary. In addition to the front and rear V's and the inner flat tracks, a 45-deg. plain surface is machined on the bed to increase the bearing of the carriage.

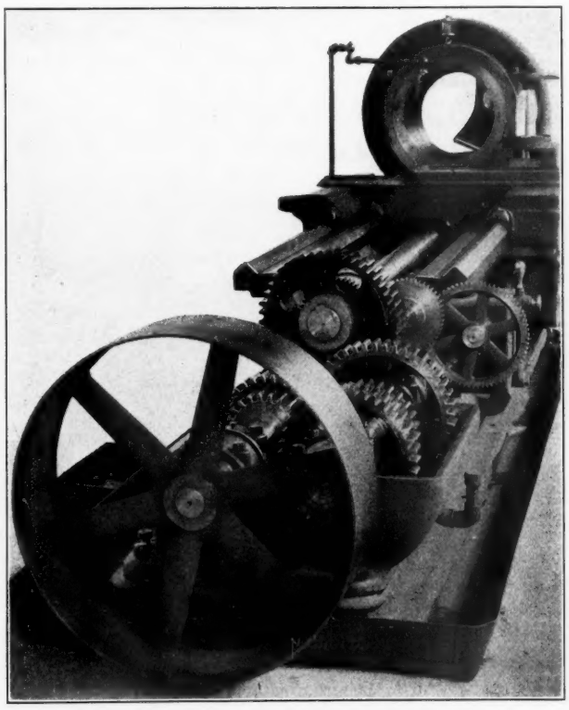
Simplicity in design and unusual ability to deliver power to the cut are claimed for the drive. Power is applied to a constant-speed pulley of large diameter and wide face, running at high speed. Variation in speed is obtained by sliding gears which run in an oil bath. All shafts are carried in bushed, positive, ring-oiled bearings. All gearing is of steel. The 4-in. driving shaft is held in alinement by a number of journal blocks bolted to the bed. There is no overhang on the pinion of the main driving gear, since the shaft is supported on eacn side of it in long bearings. The large gear meshing with this pinion is placed in the center of the driving head, and, as with the pinion, has a double bearing. All feed gears are steel. The splined feed rod is driven from the main shaft through a change-gear box, giving three feeds which may be changed while the lathe is running.



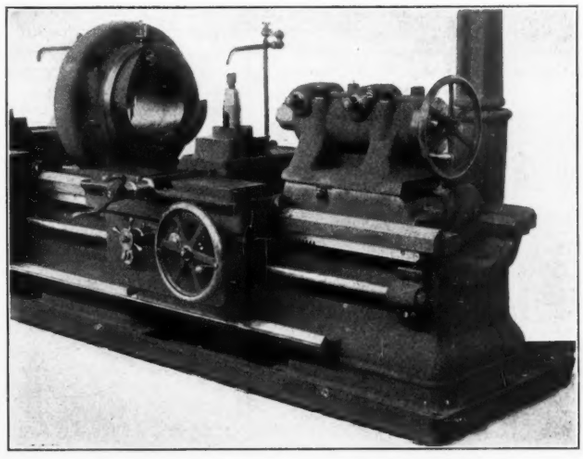
Lodge & Shipley Heavy Axle Lathe.

The apron is of compact box construction, and is tongued and grooved into the carriage. It is further supported by a third V, cast in the bed, directly under the apron. This construction supports the apron at the bottom for both vertical and transverse stress, and overcomes any spring of the apron due to the thrust from the rack pinion.

In addition to the bearing on V's on the front and back shear of the bed, the carriage also has a flat bearing or track on the inside of the front shear. A further angular bearing of 45 deg. tends to secure a permanent alinement of carriage with bed. The character of the carriage-bearing upon the bed is of importance on account of the great thrust upon the burnisher as well as from heavy cutting. Water troughs are provided around the tool slide and wings of the carriage. The tool post is arranged with hardened toothed plates interlocking with the tool and effectively preventing any possible



Lodge & Shipley Heavy Axle Lathe.
Showing 4-in. driving shaft and carriage bearing.



View Showing V Support for Apron.

swiveling or slipping of the tool under the heaviest cuts.

The tailstocks are of massive construction and firmly bolted to the bed. The clamps are brought to the top of the spindle barrel. A pawl, engaging with a rack cast in the bed, is attached to each tailstock, this design tending to relieve the stress on the clamping bolts and overcome the thrust of heavy cutting when blunt cutting-tool angles are used. The tailstock at the driving end has a stationary spindle with no transverse adjustment, the necessary adjustment being obtained from the spindle of the second tailstock, which is also provided with a transverse adjustment. The plug clamps for binding the tail spindle are of improved design, there being two for each tailstock, placed at the top of the spindle barrel.

This lathe is made by The Lodge & Shipley Machine Tool Co., Cincinnati, Ohio.

Parkesburg Iron Tube Mill.

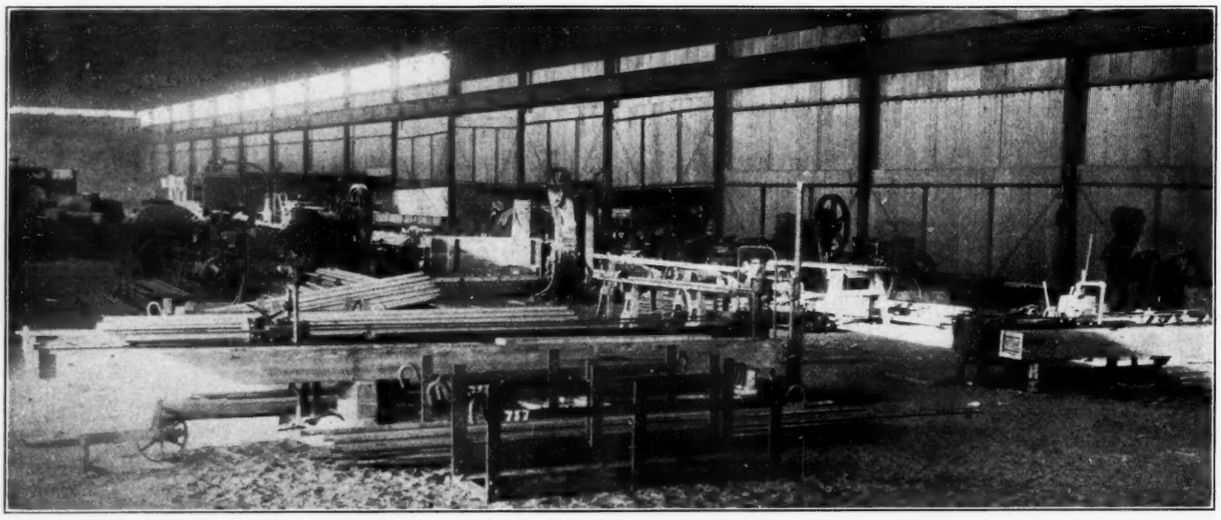
The new tube mill of the Parkesburg Iron Company, at Parkesburg, Pa., recently built and equipped with improved appliances, is illustrated herewith. This company claims the unique record, that of the charcoal iron forges and plate mills of half a century ago, it is the only one in existence to-day that has preserved and improved the old methods of manufacture and has confined its business exclusively to the production of charcoal iron.

The original mill has 26 forge fires for sinking knobbled hammered charcoal iron blooms, two bar mills for rolling the blooms into 7-inch bars, and four plate mills for rolling the bars into skelp for tubes. This plant is self-contained, having a power plant and machine shop, together with chemical and physical laboratories where the output, which in recent years has amounted to 20,000 tons annually, is daily subjected to exhaustive physical and chemical tests.

Ground was broken for the tube mill on March 11, 1908, and on November 9, of the same year, the first tube was rolled. The main tube mill building, erected by the Phoenix Iron Co., Philadelphia, Pa., is 85 ft. by 625 ft., being served in all parts by a 10-ton crane, made by Wm. Sellers & Co., Inc., Philadelphia, Pa. The one bending furnace and two welding furnaces were erected by the S. R. Smythe Co., Pittsburgh, Pa., who also had the contract for the gas producers, mains and stacks. These furnaces are giving excellent results, making tubes up to 22 ft. long. The stacks, being 4 ft. by 125 ft., afford draft which enables the furnaces to work quickly and economically. The machinery, built by the United Engineering & Foundry Co., Pittsburgh, Pa., includes cold and hot scarfing appliances, bending bench, welding rolls, finishing and cross rolls with a cooling rack, arranged with the necessary tables whereby the tubes from the time they leave the welding furnace until they are delivered into baskets in front of the straightening press and cutting off saws are not touched by hand.

The power plant, lying between the main building and the trestle, which latter conveys coal to the gas producers, consists of a battery of three 240-h. p. Maxim boilers. A compound Buckeye engine, which, with 125 lbs. pressure at 150 r. p. m., develops about 800-h. p. A 500-kw. Westinghouse generator furnishes the power necessary to turn the mill machinery which is motor driven. The necessary pumps for testing tubes and operating the few hydraulic appliances, with a small generator for lighting, complete the equipment.

A rigid system of inspection allows only such tubes to be shipped as will meet all tests required. The aim throughout has been to avoid unnecessary handling, and to facilitate as rapid work as is consistent with the best practice.



Tube Mill; Parkesburg Iron Company.

One End of Tube Mill.